RAILROAD GAZETTE

FRIDAY, APRIL 24, 1903.

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Contributions

Automatic Highway Crossing Signals.

TO THE EDITOR OF THE RAILROAD GAZETTE:

We are all familiar with the perfection to which the best automatic block signals have been brought during the past few years. Statistics show that the best automatic block signal performs its duty without failure for thousands of train movements. The failure of the best automatic block signal is on the side of safety; the signal going to danger and stopping a train when the signal is out of order. Highway crossing alarms also are so arranged that instantly any part becomes broken or disarranged the bell at the crossing will begin a vigorous warning. This warning has the effect of notifying the signal maintainer to at once repair the alarm; and the public is warned by the constant ringing of the bell—(and the visual signal exposed, if such is used)—that danger exists at the crossing. The fact that the alarm is ringing should be ample notification for the public to heed.

Considering the present high efficiency of the automatic crossing alarm, it is difficult to see why it has not been more generally adopted; the usual method being to erect a set of gates at the crossing to stop people when trains may be passing. As self-preservation is one of the first laws, an alarm given by an automatic device should be quite as efficient as a man armed with a flag or a lantern, or gates partly closing the highway. In many cases it is an impossibility for the flagman to warn people in time to prevent an accident unless he has due warning by bell of the approaching train. If the watchman at the crossing relies upon the bell why not give to the public the warning direct without interposing the services of a watchman who is liable, as all human beings are, to error?

The universal adoption of alarms at highway crossings has perhaps been delayed on account of the early experience which railroads had with these devices, when the crossing alarm was unreliable and needed too much attention for maintenance. The alarms of to-day are made on scientific principles, and are extremely simple; considerably more so than an electric block signal. They can be relied upon to positively announce the approach of every train provided they are regularly maintained. Many railroads have put in automatic crossing alarms but have expected them to work all right, without giving the slightest attention to their maintenance. An alarm which is properly installed and, after being installed, has its batteries, etc., maintained, as regularly as a locomotive is inspected, and the bearings oiled when necessary, will be found to be the most efficient "watchman" which can be placed at a crossing. Considering the fact that to patrol a crossing with a flagman or to operate gates at the crossing costs something like $500 a year, it is difficult to understand why the automatic alarm, costing less than $40 a year for maintenance, is not used at more crossings.

All crossing signals of the better type are now made on one principle, viz.: to employ a track circuit extending in each direction from the highway for 1,200 to 2,000 ft., and employing a simple relay at the crossing which in turn operates a large electric gong and (if desired) displays a visual signal in conjunction with the gong, when a train is close enough to the highway to make crossing dangerous. The sketch, Fig. 1, shows such an installation for a single-track road. For double track the track is electrified in one direction only. Statistics gathered from reliable sources show that there need be no failures of these alarms if they are inspected about 12 times a year, at which inspection the track circuit batteries located at each end of the signal limits are cleaned

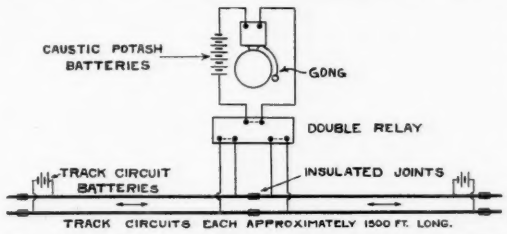


Fig. 1.—Circuits for Highway Crossing Bell—Single Track.

and replenished. The repair man should replace broken bond wires. The batteries which operate the bell at the crossing are usually of the caustic potash type. These will not freeze or evaporate and have a life sufficient on roads having 50 to 60 trains a day to operate the gong without any attention whatever for nearly one year.

Figs. 2, 3, 4, 5 show the arrangement of the interlocking relays at a crossing on single track. At *a* Fig. 2 the armatures are in their normal position, with no train near the crossing. In Fig. 3 a westbound train has entered on the first track circuit and armature *b* is released by the opening of the circuit of its magnet. Being released, the left hand end of its horizontal arm drops to the contact point, closes the local circuit and rings the bell. When

Fig. 2.

this train reaches the crossing (see Fig. 4), and thus short-circuits the current of the track circuit west of the crossing, armature *a* is also released and its arm drops; but this makes no change in the local or bell-ringing circuit. When the last car of the train has passed the crossing (see Fig. 5) and the relay of track circuit *c e* is again energized, *b* is lifted. It lifts *a* also, and therefore silences the bell. When the train clears the track circuit *w c*, armature *a* is also lifted and both armatures are then in the position shown in Fig. 2.

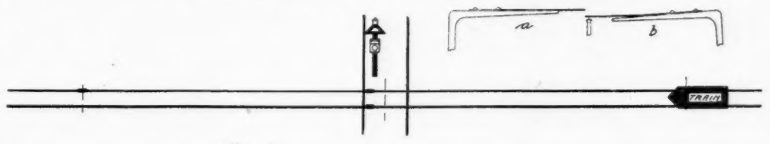


Fig. 3.

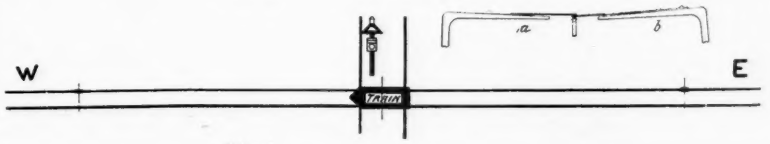


Fig. 4.

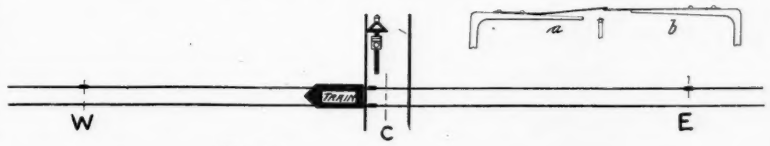


Fig. 5.

Interlocking-Relay Circuit-Closers for Highway Crossing Alarm.

The ends of *a* and *b* which engage with one another are so adjusted that the operation is the same for an eastbound train.

An alarm can be installed complete for about $200. One accident (not taking into consideration humane reasons) will nine times out of ten cost the value of several alarms. After an accident has happened at a crossing the usual procedure is for municipalities to order a set of gates or at least a flagman to be maintained at the crossing. The expense of either of these two is annually greater than it would be for 10 crossing alarms. Where gates are installed the initial investment is generally considerably more than for an automatic alarm. The records of the railroad commissions in certain States show that alarms have been very satisfactory to the public as well as to the railroad. No accidents have occurred where alarms have been installed, whereas prior to such installation, accidents, at considerable expense to the railroad, were frequent. Investigation on several large railroads shows that where a railroad company has installed a crossing signal and subsequently protection is needed at other crossings in the same town or adjoining towns, the public asks for the installation of an alarm rather than to burden the railroads with the expense of a flagman or an expensively operated set of gates. In towns where no crossing alarms have been employed an accident leads the public to ask for more watchmen, not knowing the high efficiency of alarms.

E. W. VOGEL.

Factors Affecting the Power of Locomotives.

The discussion at the last meeting of the Western Railway Club on "Equated Tonnage Rates" (*Railroad Gazette*, March 27, 1903,) revealed a diversity of opinion concerning some of the factors which control the maximum power of a locomotive. Without doubt, the most important development in the locomotive within the past 10 years has been the increase in power by the use of large boilers. While the valve design and area of ports effect to some limited extent the efficiency of the cylinder action, nevertheless the maximum power of the locomotive is dependent only on the ability of the boiler to supply steam. The following extracts from the discussion are of interest:

Mr. Wm. Forsyth: The author states that the maximum tractive power cannot be sustained on account of the inability of the boiler to furnish sufficient steam. This conveys the wrong impression that the reason why tractive power decreases with speed is due to the boiler, and we should infer from it that if the boiler is large enough the tractive power would not decrease with speed, and while it may be understood by those who have studied the question, it is worth discussion as to what extent the boiler does limit tractive power. If the boiler pressure is sustained at 40 miles per hour (and it should be) with constant horse-power, the tractive power will be only one-half that at 20 miles per hour, and this is due to the fact that horse-power is made up of tractive force and speed, in foot pounds, and if speed is increased the tractive force must decrease, the curve being a hyperbola. While the boiler is maintaining constant pressure and therefore constant horse-power, the tractive power may decrease by speed to one-fourth or less than that at slow speed.

The principal cause of decreased tractive force with speed is the reduction in cut-off and increase of wire drawing—in other words, the inability of the steam to pass through the valves and cylinders fast enough and in volume sufficient to sustain constant traction. If this were possible the boiler for constant traction at 50 miles per hour would have to be five times as large as that required at 10 miles per hour. The decrease in tractive force with speed should therefore be explained as largely due to the fact that both engine and boiler when properly proportioned can only maintain a constant horse-power and that if speed increases tractive force must necessarily decrease and in a ratio which makes a hyperbola curve, and to this must be added the further reduction due to decrease in cut-off and to wire drawing.

So long as the engine can only pass through cylinder and valve sufficient steam to sustain horse-power with increasing speed, it would be useless to make the boiler any larger, and the boiler, which sustains boiler pressure at high speeds, cannot be said to be too small, nor does it limit tractive power. At some particular speed an engine will develop its maximum power, depending on the proportion of cylinder and design of valve motion. Any increase above this speed requires a certain proportion of available horsepower to be converted into speed instead of traction, and the tonnage must decrease with this loss of traction.

Prof. Goss: Permit me to emphasize the fact that the subject under discussion is one of many variables and if those interested are to agree, everybody must get the same point of view. For a general consideration of the question, it is not necessary to discuss the wire drawing action or any question of detail affecting the steam distribution within the cylinder. While these are matters of great importance in themselves, they do not immediately concern the problem in hand. The reason is to be found in the fact that after the speed has been raised to a point where adhesion no longer becomes a limiting factor, the cylinders can be made to take care of all the steam which the boilers can generate in spite of the wire drawing action, and they can be made to take care of all this steam under conditions favorable to a highly efficient performance. For example, if at a given speed the full power of the boiler is not utilized, it is required only to lengthen the cut-off until a point is reached where the demand upon the boiler will fully equal its capacity. It makes no difference what this speed is. It is a thing which, as locomotives are now designed, can always be done. Moreover, it will be found that for speeds sufficiently high to eliminate the adhesion as a limiting factor, the range of cut-off necessary is not great for a wide range of speed.

Mr. Wickhorst: What are those ranges?

Prof. Goss: The longest cut-off under a full open throttle and at speed will generally not need to equal half stroke and the shortest will generally not need to be less than a quarter stroke. It is a significant fact that the cut-off does not have to be diminished in proportion as the speed is increased since the wire drawing effect to which reference has been made, comes in as a partial substitute for a reduction in cut-off. It is for this reason that the cut-off at very high speeds may be nearly as great as the cut-off for moderate speeds. The mean effective pressure, however, will vary inversely as the speed,

In both cases, the full capacity of the boiler may be utilized and the efficiency of the cylinder action will not be materially changed.

Mr. Fergusson: I have always been brought up to think that the decrease in the tractive power due to speed was due to the decrease in the mean effective pressure on account of the piston speed; that after you get above a certain point the piston speed will cause a great decrease in the tractive force on account of getting a very much lower mean effective pressure.

Prof. Goss: What has been said is true. The draw-bar stress does diminish because of the wire-drawing action, but that is not the whole question. Conditions existing in the presence of wire-drawing may be greatly modified by manipulation of the reverse lever, and, hence, wire-drawing by itself is not a controlling factor.

Mr. Fergusson: The question has been discussed purely from a theoretical standpoint; I was talking about how locomotives were built.

Prof. Goss: I do not wish to limit my statements as applicable to an ideal or theoretical engine. An engine which at speed is popping off is probably not working at its maximum power. For maximum power the reverse lever should be dropped until all the steam the boiler can make is used in the cylinders. Why is this not done?

Mr. Fergusson: It would make such a pull on the link, you are liable to tear your link all to pieces.

Prof. Goss: That certainly is not entirely a theoretical question. I doubt if it applies to engines at speed.

Mr. Forsyth: You could not force the steam through the cylinders and valves.

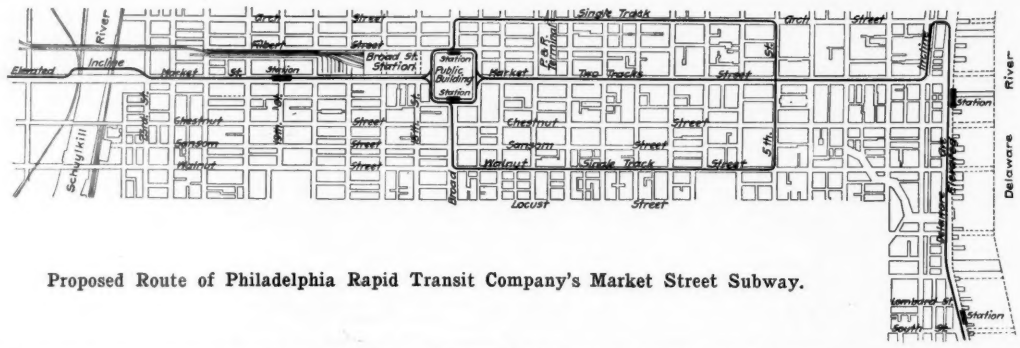
Prof. Goss: It is true that you cannot go beyond a certain limit in forcing steam through the cylinders. An attempt to overwork the cylinders results in extremely high back pressure and a heavy drop in the initial pressure, consequently steam does not go through. All that is true but these are conditions which in service result in rapid exhaustion of boiler capacity. In general, one may safely assume that after the speed is so high that adhesion ceases to be a factor in limiting the output of power, the maximum boiler capacity will be reached before the ability of cylinders to economically handle the steam supplied them, has been exceeded.

Philadelphia Rapid Transit Plans.

The plans of the Philadelphia Rapid Transit Company for the relief of traffic in Philadelphia have been developed to a large degree by the physical surroundings of the city. Philadelphia, as well as New York, is built between two rivers which form a sort of peninsula, but with the main difference that in New York an overwhelming proportion of the traffic runs north and south, while in Philadelphia it runs in all directions, but chiefly from east to west. The Delaware River on the east and the Schuylkill on the west interfere. The Delaware has always proved a stumbling block to travel in an easterly direction, while the Schuylkill, which is a small stream, has been spanned a number of times and cannot be considered much of a hindrance, as is shown by the recent rapid growth of West Philadelphia.

The chief problem at present lies in the over-crowded surface transportation which is hampered by the narrow streets. Most of these are only 25 ft. between curbs and allow but a single track. The same lack of police regulation also prevails here as in many large cities in the passage of carts and loaded vehicles, which are allowed to line up against the sidewalk and unload directly in front of a crowded car during rush hours. This problem is in no way lightened by the fact that the business portion of Philadelphia is crowded into a very small area, bounded on the east by the Delaware River, and on the west by the Pennsylvania Railroad terminal at 15th street. In this small space, which is hardly more than a mile long and half a mile wide, are located the important business and commercial houses, theatres, railroad terminals and public buildings. The cramped formation of the business portion of the city has hampered attempts for the relief of traffic congestion.

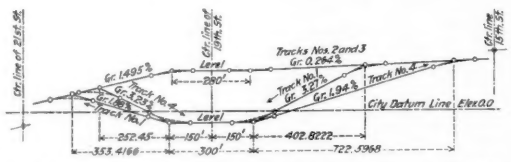
From December, 1892, when the first electric car was run by the Philadelphia Traction Co. on its Catherine & Bainbridge Division, up to the present day, Philadelphia has been wrestling with this problem. In 1900 it was found that the maximum schedule speed and the maximum number of cars had finally been reached on most of the surface lines in the city, and that some other means must be found for transportation. During the early spring of 1901, the Focht-Emery bills were passed granting franchises for five elevated and one subway line over the main arteries of travel in Philadelphia, besides several franchises for surface lines on a few narrow streets as yet without transportation facilities. The names of the elevated companies which obtained franchises at this time were the Ridge Avenue Elevated, the Frankford Elevated, the Passyunk Avenue Elevated, the Germantown Avenue Elevated, the Broad Street Subway and the Market Street Elevated. These bills were signed June 13, 1901, by Mayor Ashbridge. The franchise for



Proposed Route of Philadelphia Rapid Transit Company's Market Street Subway.

the Market street subway from the Delaware River to the county line was afterwards secured by the Market Street Elevated R. R. All the Rapid Transit franchises granted June 13, 1901, as well as the franchise for the subway under Market street, approved April 9, 1902, have now been taken over by the Philadelphia Rapid Transit Co.

This company proposes to build at once the Market street line from 63rd and Market streets to the east side of the Schuylkill River as an elevated, passing underground at that point and continuing underground to Delaware avenue, being elevated from that point along Dela-



Grades of the Approaches to Nineteenth Street Station.

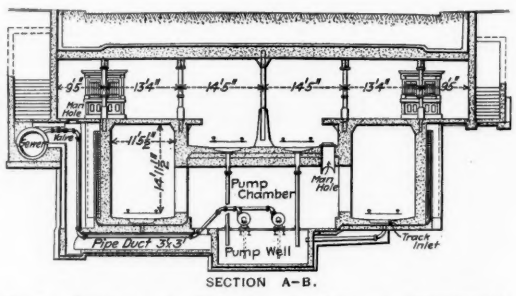
ware avenue to South street. The section from the loop around the city, beginning at 15th street, to the east side of the Schuylkill River at 23rd street, is to be a four-track subway. The east and westbound inside tracks of this section, over which the trains stopping at the 19th street station pass, are on the same level throughout the subway. The two outside tracks, numbers one and two, make a dip just beyond 15th and 23rd streets respectively, and pass under the station at 19th street at average descending and ascending grades of 3.25 and 1.91 per cent., as shown by the cut. Trains over these tracks are not to be expresses, as commonly reported. They will pass under the station simply as a convenience, for it has been estimated that the two middle tracks will be sufficient for all the business at this station. All four tracks will join again at 21st street and cross the Schuylkill river bridge, where the inside tracks will continue on the surface of the street on the west side of the Schuylkill, and the two outside tracks will continue as an elevated line to 63rd and Market streets. The line from the public buildings to Delaware avenue will be a two-track subway, forming the eastern section and connecting at Fifth street with the two single-track branches of the subway to be built under Arch and Walnut streets.

The contract for section three, between 15th and 23rd streets, has been let to E. E. Smith Contracting Co., Philadelphia, successor to E. D. Smith & Co. Ground was broken at 23rd street on April 6, and it is thought that this section will be completed in about 18 months. The estimated cost of this portion of the subway is approximately $500 per running foot.

The only station on this section will be at 19th street. Detailed drawings of this station and the subway approaches to it are presented here. It will have two entrances, both on Market street, as the City Council has refused to grant a permit for stairways on 19th street. Negotiations are now pending, however, for obtaining the property on the northwest and southeast corners. Great care has been given both to drainage and ventilation. There will be a central drainage chamber from which two centrifugal pumps will pump the water through connecting ducts up to the Market street sewer. The capacity of these pumps will be determined when the subway is finished and the engineer is able to estimate the average depth of water in the drainage chambers. Ventilation will probably be supplied by exhaust fans located at the various stations. The width of this western section will be 74 ft. 4 in., and the depth from the street to the bottom of the drainage chamber, 48 ft. The chambers for the outside tracks will be 14 ft. 11½ in. high, and 11 ft. 5 in. wide, and those for the middle tracks, 14½ ft. high and 12½ ft. wide.

In the design of the subway, allowance is made for the heaviest pavement liable to be placed, viz., granite blocks on a concrete base, 6 in. thick. The weight of this pavement, allowing for depth of 15 in., which includes a 3-in. sand cushion under blocks, is 175 lbs. per sq. ft. The weight of the earth is taken at 110 lbs. per cu. ft., below the base of the pavement. The total dead weight resting on the top of the roof thus varies between 260 lbs. per sq. ft. for 2 ft. cover, up to 1,140 lbs. for a 10-ft. cover, and proportionately for other depths. The minimum cover above the top of the roof is 4 ft., except in special cases, and the maximum, as far as the work has progressed up to this time, is between 9 and 10 ft.

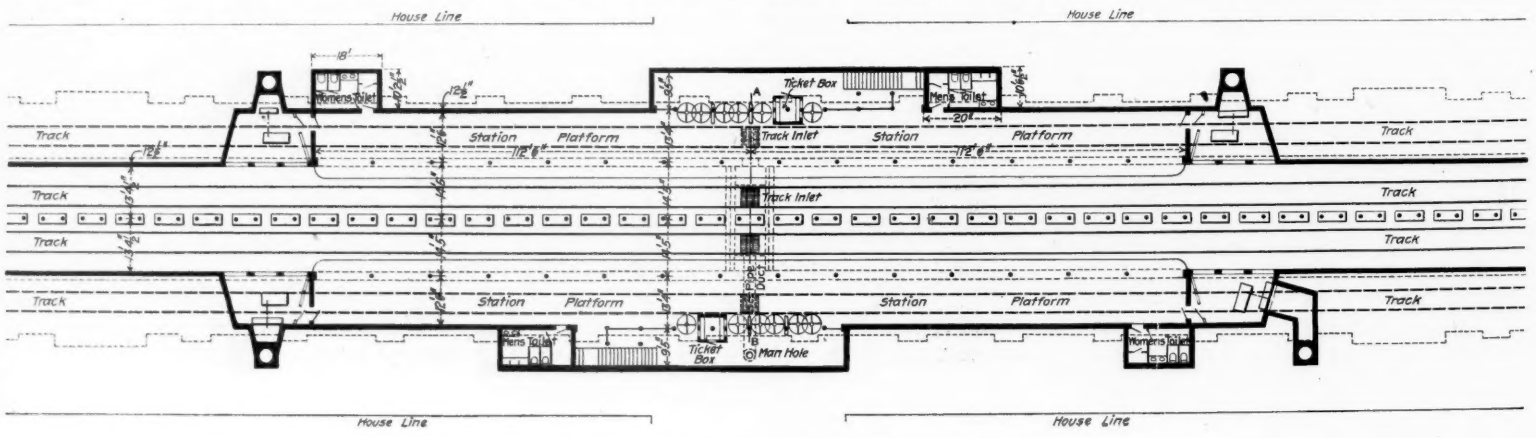
The concentrated load consists of 10 tons on each of four wheels, making 40 tons in all, 20 ft. between axles, and gage 6 ft. This load is considered distributed by the pavement and the earth, between the pavement and the roof. In this distribution, equivalent loads for simplicity of computation are worked out so that each of the two pairs of wheels is replaced by a rectangle loaded with a load equivalent to the weight on the wheels. These rectangles are the same distance c. to c. as the axles, viz., 20 ft. The equivalent distributed load on the said rectangles varies from 1,180 lbs. per sq. ft. for a 4-ft. cover, to 200 lbs. per sq. ft. for a 16-ft. cover, the loads for intermediate covers varying, though not directly, with the



Cross Section of Subway Station at Nineteenth Street.

depth. Where the cover is 3 ft., the load is 1,330 lbs. per sq. ft. Special shallow construction is treated as each individual condition makes necessary.

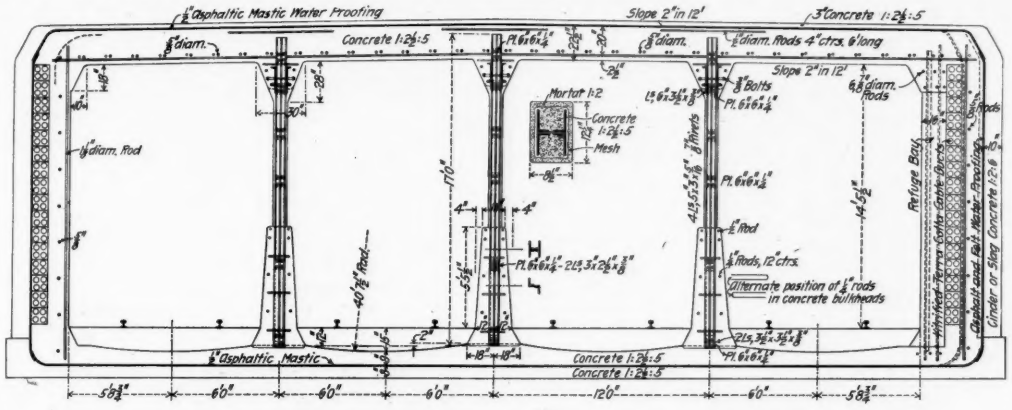
In addition to the foregoing concentrated loads, a general load of 200 lbs. per sq. ft. is applied exterior to a space 30 ft. long and 11 ft. wide, placed symmetrically to the concentrated load, the greater length parallel with the



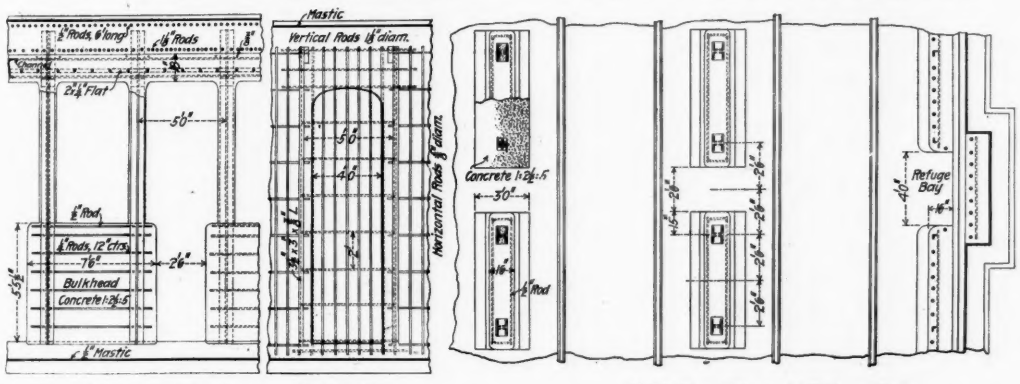
General Plan of Subway Station at Nineteenth Street.

longitudinal axis of the latter. The foregoing loads are applied so as to produce the maximum effect on any member of the construction. The concentrated load used in this work is in accordance with experience in Philadelphia covering a number of years, and is considered an adequate allowance for the heaviest loads liable to be transported about the streets.

The lateral pressure on the side walls allowed for, consists of two parts: First, the dead weight of the material exterior to the walls, and second, superficial load 200 lbs. per sq. ft. The pressure on the walls is computed by the theory of earth pressure as developed by Rankin.



Half Cross Section Through Standard Construction. *Half Cross Section Through Refuge Bay.*



Elevation of Bulkhead. *Refuge Bay.* *Half Plan Through Refuge Bay.*

Details of Cross Section of Four-Track Subway.

The coefficient by which the pressure is determined, varies in the different soils, and is based on experience in dealing with the soils in this city.

In special cases where the work approaches closely to heavy buildings, the weight of the buildings is considered in determining the strength of the walls, as there is no rock above the floor of the subway, except in very few places. Where continuous masonry structures, such as manholes or other street appurtenances are founded upon the roof of the subway, by which the estimated distribution of the concentrated loads would be partly vitiated, grillages will be placed to insure proper distribution to correspond with the allowed loads.

When the subway is completed three-car trains will be run regularly, subject to increase in number as traffic increases. The platforms at the various stations are to be long enough to hold a 6-car train. The average speed of elevated and subway trains will be 16 miles per hour, while the average speed of the surface lines in Philadelphia, at present, is but 8 miles. It is too early to make an estimate of the number of passengers the Market street line will have, but running, as it does, from the ferries in the lower part of Delaware avenue, through the business section of the city, past both the large railroad terminals to the rapidly growing suburbs of West Philadelphia, it ought to prove a success.

The Lucin Cut-off Across Great Salt Lake.

In contradiction of many newspaper stories of "Salt Lake's Bottomless Pit," Mr. William Hood, chief engineer of the Southern Pacific, furnishes the following statement to the *Railroad Gazette*:

The yarns and fake stories circulated from Salt Lake City about difficulties and disasters attending the building of the Central Pacific cut-off from Ogden to Lucin are without foundation. I have never heard of any scientist examining the so-called peculiar and wonderful bottomless pit for Mr. Harriman, nor did I even know that any bottomless holes existed in the bottom of Great Salt Lake along the line of our improvement.

As a matter of fact, we have experienced less trouble from the settling and sinking of material dumped into the lake than is frequently encountered in work of this character. Everybody knows that there is most always more or less settling of material dumped into water and the only thing to do is to keep on adding to the mass until it stops settling. The Salt Lake fill has really been very easy to handle and a small percentage only of material deposited has sunk or settled, thus eliminating many mishaps and trouble often attending even ordinary construction work along railroads. The story that we have driven pile after pile one on top of the other, in an attempt to find solid ground for a roadbed foundation, is too silly to talk about.

Another thing, the company has never lost an engine or car through sinking into the lake, nor has even an engine or car ever been splashed with water or mud. Every bit of work done so far has remained intact and we are progressing towards completion in a manner satisfying to the highest degree. Four great steam shovels are at work loading dump cars with material and are depositing between 110,000 and 120,000 cu. yds. of rock and earth along the fill every week. This fill is about 26 miles long, of which 11 miles is to be on a trestle and about 15 miles on solid filled in ground. The trestle will bridge the deeper portion of Salt Lake where the water is about 30 to 35 ft. deep. The trestle will be completed in about two months, or a trifle more, but it will require a longer time to do the filling of the solid portion of the cut-off. Eventually the entire thing will be solid ground, as we intend to deposit material until it is all solid. If we waited to do that now it would take too long, as we want to get trains operating over the new line as soon as possible or long before the beginning of next year. We will save about 43 miles in distance over the present route via Promontory when the cut-off is opened for traffic. I wish to state absolutely that all of these stories about vast unnecessary expense and trouble attending our work on this improvement are false in every detail and nearly all of the yarns I notice started from Salt Lake City, where we have some enemies who have a grievance against the company because it did not care to build 65 miles of track around the southern shore of Salt Lake into Salt Lake City. Quite a number of people there are resentful towards the company and its fill cut-off.

No secrecy has ever been maintained about our work, which some reports state has been the case, for fear something might be found out about our "terrible sink holes." That story no doubt originated because I have issued strict orders that no person shall be allowed around the work or on work trains without a special permit. I do not allow any superintendent even to grant this permission because it is unsafe to let people on premises where big construction is being carried on. I simply did this to avoid accidents and not to conceal anything, because there is nothing to hide. We have a complete electric light plant and the work is carried on night and day.

Life of Preserved Ties.

The data gathered for this year's report to the Maintenance of Way Association confirm the statements heretofore given as to the average life of treated ties in this country. The record of treated pine ties taken out of tracks of the Atchison, Topeka & Santa Fe during 1901, compiled under the direction of Mr. H. U. Mudge, General Manager, show the following:

Removed in 1897 on 6 divisions, average life, 10.18 years.
Removed in 1898 on 7 divisions, average life, 10.56 years.
Removed in 1899 on 8 divisions, average life, 10.61 years.
Removed in 1900 on 9 divisions, average life, 10.78 years.
Removed in 1901 on 10 divisions, average life, 10.58 years.

Mr. Mudge says: "Special attention should be called to the fact that these figures represent only the average life of treated ties taken out on account of rot, and not the average life of all ties treated during each year." Also: "It must not be overlooked that it is the 'weak sisters' which come out first; the strong, sound ones remaining in a much longer time, under the principle of the survival of the fittest."

On the Chicago, Rock Island & Pacific the returns of treated ties renewed in 1901 show an average life on that road east of the Missouri River of 10.66 years, and it is estimated at one year more west of the Missouri River.

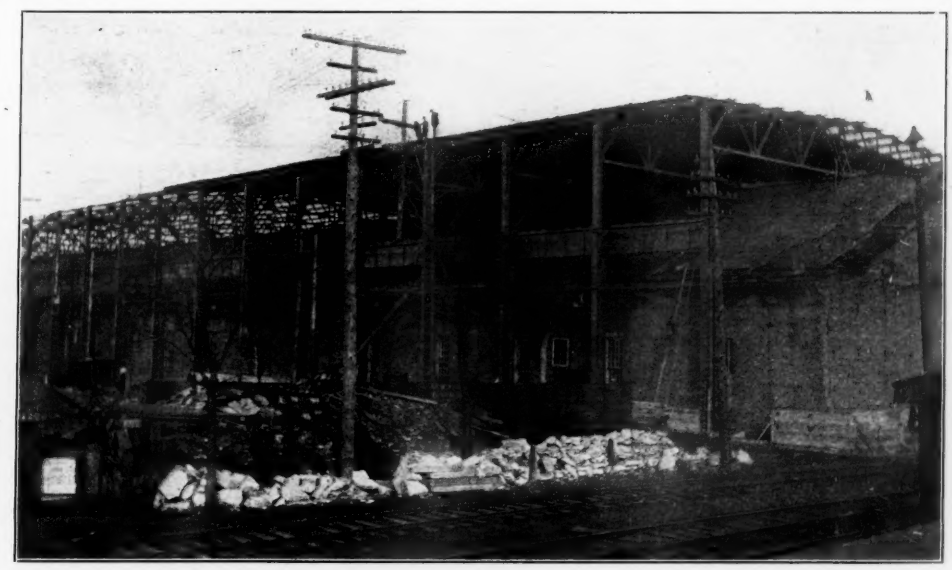
On the Southern Pacific the data may be summarized as follows:

Atlantic System.—Total number of treated ties laid, beginning with 1887, 2,971,382. Total number removed to June 30, 1902, 641,918. All ties laid in 1887-8-9 had been removed; 17 per cent. of the 1890, 64 per cent. of the 1891, 83 per cent. of the 1892, and 90 per cent. of the 1893 ties are reported to be still in track.

Pacific System.—Total number of treated ties laid, beginning with 1894, 5,491,976. Total number removed, 251,961. Eighty-five per cent. of the ties laid in 1894, 75 per cent. of the 1895, 85 per cent. of the 1896, 94 per cent. of the 1897, and 98 per cent. of the 1898 are still in track.

On the Pennsylvania Lines West of Pittsburg the following record is furnished by Mr. Thos. Rodd, Chief Engineer. The results of tests of ties laid in 1897-1898, etc., are not yet in such shape that they can be tabulated:

				Removed account of decay.								
Station.	Kind of ties.	Put in.	No.	1897.	1898.	1899.	1900.	1901.	1902.	Total.	Per cent.	Aver. life, years.	Kind of ballast.
Hanna.....	Burned hemlock	1892	200	1	4	6	..	39	38	88	44.	0.1	Stone
Hanna.....	Untreated white oak	1892	200	..	..	8	46	26	9	89	44.5	8.4	"
Kosciusko.....	Burned tamarack	1892	200	..	..	2	71	84	43	200	100.	8.8	Gravel
Kosciusko.....	Untreated white oak	1892	200	..	..	2	27	73	71	173	86.5	9.2	"



Cocoon and Chrysalis.

The engraving shows the always interesting process of building a new structure around an old one without interfering with the daily service. This is the New York Central's old erecting shop, at West Albany, which is kept in commission until the new steel building enclosing it is done.

Danish Government Railroad Ferries.

BY WILLIAM KOLVIG.

America is not the only country where ferries for taking on board trains of cars and transferring them for considerable distances are in use. Ferries of this kind, employed in daytime for freight cars, and at night for both freight and passenger trains, are used for through trains

Fig. 1.—Denmark.

in the Kingdom of Denmark. A glance at the map of Denmark shows the country to be composed of the mainland Jutland and a lot of islands, only the larger islands being provided with railroads. Commercial connections between the islands and the mainland as well as with Sweden were formerly very slow, the distances over the Sound and the Belts being too great for bridges. To overcome this slowness in transport the Danish Government began in 1871 to ship cars from the railroads directly on to a sort of whale-back steamer, that ferried them over the "Little Belt" between Strib and Fredericia. In the following years the government put on boats between Korsoer and Nyborg on the "Great Belt" that separates the islands Seland and Funnen, also on the two lines across the Lim-Fjord in the north of Jutland and between the Islands Seland and Falster, at Masnedsund.

But it was in the years 1891-1895 that this enterprise showed its full importance. Car ferries were established between Elsenoer and Helsingborg and between Copenhagen and Malmoe. These last made a connection between the vast network of European railroads and those of Scandinavia. Now, therefore, products from southern France, Germany and Italy can be taken direct in cars to any part of Sweden, Norway or Finland without unloading. Passenger cars may be run through to Copenhagen, and it is not unusual to see carriages belonging to the International Sleeping Car Co. on the Danish lines.

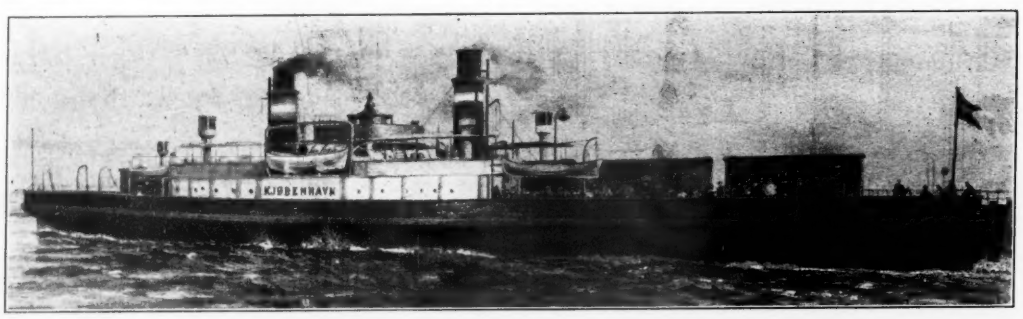


Fig. 2.—Danish Government Railroad-Car Ferry-Boat "Copenhagen."

Fig. 3.—Car-Ferry Landing at Fredericia, Jutland.

Though the ferry-boats take on passenger cars, the transport is mostly for goods, and it is only on the Little Belt that sleeping cars from the through express trains are taken. For passengers in daytime the boats are provided with all the necessities of a first-class steamer, and the promenade on deck is more agreeable than sitting in a car during 1¾ hours, which is the time taken to cross the Great Belt. There are two types of ferry-boats. The larger, double-track boats, able to take on board from 16 to 18 cars of 10 tons each; and the smaller type, that will transfer six of these cars. These ferry-boats, with their deck covered with cars, move very steadily even in rough weather.

The Danish government owns in all 16 ferry-boats, of which four are of the big type. Their total tonnage is 13,791 tons and their nominal horse-power 22,000. All these boats are paddle steamers, with the exception of three, that are specially designed for breaking and forcing their way through ice in winter time. The newest of the ferry-boats is called the "Kjöbenhavn" (Copenhagen) and sails between Copenhagen and Malmoe in Sweden. It is a boat of considerable dimensions, being able to take on board 18 cars. In the middle of the vessel, the bridge-deck, with the steam steering gear, is supported on an elevated platform that permits the passage of cars underneath. The boat is identical forward and aft, so it can enter either way into the landing stage, a V shaped bulwark, into which the ends of the steamer fits. At the innermost end of this bulwark, nearest land, there is an adjustable bridge 55 ft. long. Under deck are big cabins and restaurants, on deck two smoking-rooms, lavatories, the kitchen, etc., all lighted by electricity and steam heated. The lighting up of the deck at night, at landing or leaving port, is effected by a great cluster of incandescent lamps suspended from a bracket on a pole near the smoke-stacks, one in each end of the vessel. This method has been found to give a better and more diffused light than the arc-lamps formerly used. The dimensions of the "Kjöbenhavn" are:

Length between perpendiculars, ft.	280
Mean draught, ft.	10
Displacement, tons	1,450
I.H.P.	2,160
Highest speed loaded, knots per hour	14

The engines are of the diagonal type, placed amidship between two boiler rooms.

The following table shows the increase of traffic. The first line in the table shows the traffic in the year, when ferries were first used on the given lines:

Year.	Transport on—	Passengers.	Goods in tons.
1871	Little-Belt	116,000	9,200
1886		169,000	47,000
1898		437,000	242,000
1883	Great-Belt	132,000	14,500
1889		165,000	46,800
1898		428,000	230,000
1891	Over the Sound at Elsenoer	124,000	3,000
1895		160,000	75,000
1898		236,000	94,000
1895	Over the Sound at Copenhagen	...	5,500
1898		...	91,400

In the near future ferry-boats will connect Gedser, the southernmost point of the Island Falster, with Warnemünde in Mecklenbourg. This last port is on the direct line to Berlin, and with this in view, the Danish Government has built a number of new passenger cars, on the American or Pullman plan, with an inside passage through the middle and running on two four-wheel trucks; also others in the Austrian or Mann style, with an inside passage along one side of the cars.

Locomotion and Transport in London.

BY EDWARD DAVY PAIN.

The purpose of this article is to afford some account of the task awaiting the Royal Commission which was appointed in February "to inquire into the means of locomotion and transport in London, and to report:

"(a.) As to the measures which they deem most effectual for the improvement of the same by the development and inter-connection of railroads and tramways on or below the surface, by increasing the facilities for other forms of mechanical locomotion, by better provision for the organization and regulation of vehicular and pedestrian traffic, or otherwise; and

"(b.) As to the desirability of establishing some authority or tribunal to which all schemes of railroad and tramway construction of a local character should be referred, and the powers which it should be advisable to confer upon such a body."

It will be seen at once that these words give a very wide scope to the Commissioners. The personnel of the Commission is interesting, and the 13 members can be classified as follows: Three especially competent to deal with the financial aspect, three versed in railroad matters, two representatives of the London County Council, one representative of the Board of Trade, one engineer, one representative of the Home Office, one representative of the Borough Councils, and one representative of the Opposition party in Parliament.

London is an old city, which compares with New York, Boston and Chicago in the same manner as an old-fashioned workshop to which additional buildings have been annexed from time to time to cope with increasing business, compares with the modern workshops of more recently established rivals. Consequently it suffers in the same way, each year more intricate organization is required. The American method, in such instances, is entire reconstruction; in England we employ other less revolutionary methods.

If we carry the simile further we overstep the bounds of practicability; property in London to-day is of such enormous value that improvements must be done piecemeal and gradually, especially in the neighborhood of the city where the highest values per square foot exist, and where relief from congestion is most needed.

Nine main trunk lines have 13 terminal passenger stations, 12 north of the Thames and two south of it, the goods and other depôts, though more numerous, being situated approximately in proportion. The traffic brought into the Metropolis by them divides itself under two heads, passenger and goods; the former being capable of sub-division into suburban and traveling traffic; the latter into inward and outward traffic. It is when we consider how the sorting process of this vast medley commences that we find ourselves approaching the root cause of congestion in London streets.

To deal with this to and fro movement, there are 3,170 licensed omnibuses (each capable of carrying over 20 passengers), 11,304 licensed cabs, 1,000 tramcars, and 6,000 railroad vans, in addition to the Metropolitan and District Railroads, and the three existing tube railroads, the Central London, the City and South London, and the Waterloo & City. The means of transport thus afforded are quite insufficient, and the following principal methods of relief have been suggested:

(1.) A comprehensive scheme of tube railroads.

(2.) A system of shallow underground tramways in connection with the existing surface lines.

Dealing with the first:

The advantages of tube railroads over shallow underground tramways are that they are less likely to excite opposition when promoted, afford less interference with owner's or lessee's rights, are easier to build, and are more easily confined within narrow limits by the placing of one tube above another.

The City & South London, which serves the districts its name implies, was the pioneer line of this class. Its financial success was not so great as was hoped, its ordinary stock even at present standing well below par, and this fact militated for a time against promotion of new similar lines. However, the Central London Railway, for which the necessary capital was heavily underwritten, showed for its first half year's working a dividend at the rate of 4 per cent. per annum, and its ordinary stock at present is quoted above par. The Waterloo & City is a much shorter line, having only two stations, one at the terminus of the London & South Western and the other at the Bank, in the city, and after a less promising start than the Central London it showed on the last half year's working a dividend of 3¼ per cent. per annum on the ordinary stock.

The success of the Central London, and the improvement shown by the other two lines, were followed by applications for powers to build other tubes. Two which were sanctioned are now approaching completion; the Baker Street & Waterloo, which will give much needed communication between the termini of the Metropolitan and London & South Western Railways, and the Great Northern & City, which will give facilities to those coming to the city from the northeast of the Metropolis. It is possible that the promoters of other schemes which have been authorized will be chary of exercising their powers until the report of the Royal Commission has been published, and therefore their schemes need not be explained at present.

The schemes promoted in 1901 were held over until the following year, when, in company with many others (the total estimated expenditure being about £40,000,000), they were given an exhaustive hearing by a joint committee of the two Houses of Parliament. The unusual course of calling financial evidence was adopted to insure, if possible, the execution of the lines authorized, and this upset several speculative ventures, so that the real issue lay between two groups, designated at the time after the chief promoters, Yerkes and Morgan. When Messrs. J. S. Morgan & Co. had apparently worsted their rival, Mr. Yerkes nullified the whole work of the session by obtaining control of the London United Tramways Company, which had been working in unison with the group of Messrs. Morgan & Co., and withdrawing the bill promoted by them. This action evoked much adverse comment at the time and matters were brought to a head when the London County Council approached the Board of Trade and asked for a Royal Commission on the subject.

I have recapitulated the tube movement in order to show that it is primarily responsible for the present situation, and to prove that the general opinion points to this remedy first, as a means of alleviating the pressing need for some authoritative action. The question as to the route of new lines is such that the greatest care will have to be exercised in the granting of powers to new com-

panies, because the Central London and the authorized schemes of Mr. Yerkes are already in possession of the most valuable routes, and consequently are better fitted to work less profitable districts in conjunction with the others.

Experience in London so far has showed that while serious objections can be raised against this class of railroad, yet certain material advantages can be pointed out over rival propositions. During the Parliamentary inquiry in 1902 the following *pros* were chiefly dwelt upon: (a) Quick service; (b) quick booking; (c) cleanliness; (d) no delays due to fogs; (e) cheap fares.

While on the other hand those opposing urged, as *cons*: (a) Vibration acting on house property detrimentally; (b) defective ventilation; (c) appalling results of an accident, due to panic in a confined space and risk of fire; (d) damage to buildings due to subsidence of ground during construction of tunnels; (e) difficulty of accelerating the speed.

Looking at these points more closely, first from the promoter's point of view:

(a.) A two and a half minutes' service during the busy parts of the day, and frequent workmen's trains from 5:30 a.m. in the early morning can be given.

(b.) By the adoption of uniform fares (e.g., on the Central London, where two pence from any station to any station is single fare) and the avoidance of different classes much time can be saved.

(c.) No sulphurous atmosphere due to steam engines. The white glazed brick work lining at the stations ensures the utmost cleanliness.

(d.) The impossibility of fogs penetrating to the tunnels and so causing delays.

(e.) The favorable comparison with other railroad and omnibus fares.

Taking up the arguments of the opposition:

(a.) The experience of householders on the route of the Central London Railway showed that in some cases the vibration set up by the locomotives was so great that mirrors over mantels had cracked in two.

(b.) Actual working showed the fallacy of the original theory that automatic ventilation would ensue by the moving train on its approach to a station pushing the exhausted air in front of it up the shafts and on its departure drawing a fresh supply down the shafts by the vacuum created. As a matter of fact, the stoppage of the train is so brief that the same air that was forced up is sucked down again. Hopes have been held out that by the aid of large rotary fans this state of affairs will be remedied, but at present the atmosphere is not pleasant.

(c.) As yet no serious accident has occurred, but the danger of fire attending an accident has been shown by the loss of several lives last year on the Liverpool Overhead Electrical Railway, where the line was in tunnel.

(d.) Unless great care is exercised in filling with grout the space between the back of the lining of the tunnel and the surrounding soil, of whatever nature, subsidence on the surface will probably occur and cause damage to buildings above.

(e.) The evidence on this point was directly contradictory, but showed that increase of speed means increase of motor space, which it is difficult to obtain.

The size of the running tunnels vary from 10 ft. internal diameter to 16 ft. internal diameter, the most favored size being between 12 ft. and 13 ft. The station tunnels vary from 20 ft. to 26 ft. The usual diameter of the vertical shafts for lifts, etc., is 40 ft. The excavation is effected by means of the Greathead Shield with various improvements in the running and station tunnels, and by hand labor in the approach tunnels. When water bearing strata are encountered, compressed air is employed. The excavated material, where direct access to a temporary wharf in the river is unobtainable, is carted to wharves where barges carry it either out to sea, or to some place where reclamation of land is in progress. The cast-iron tunnel rings consist of about seven or eight segments with a key piece; the actual number depends upon the stratum being pierced and upon the opinion of the engineer. The station platforms range from 200 ft. long to 250 ft. and upwards. House property is bought for the site of the stations, there being no available space for their erection on the sidewalks. Most engineers now allow a margin of 15 per cent. for contingencies when estimating the capital expenditure.

In 1902 the London County Council instructed their Tramways Manager and Electrical Engineer to visit America in order to obtain " . . . the fullest information possible with regard to the systems of shallow underground tramways in operation there. . . ." Their report, published in the same year, clearly states their favorable attitude towards the construction of a system of subways with regard to London as a whole, and an addendum to the report by the Vice-Chairman of the Highways Committees supports their views.

Since then, the London County Council has been identified with this suggestion, which is worthy of consideration, since their representatives were provided with every facility for seeing such systems, in full working operation at Boston and under course of construction in New York.

The arguments for this method may be summarized thus: (a,) Construction should be less costly than with the tube system. (b.) Less dangerous in case of accident. (c.) Easier of access than deep level railroads. (d.) By including a gallery for sewers, mains, etc., the tearing up of the streets can be saved. (e.) Absence of vibration. (f.) Good ventilation.

The chief arguments on the other side are: (a.) Probable difficulty of obtaining parliamentary sanction, except in the case of new streets. (b.) By being in connection with the surface lines, these would become more crowded. (c.) Owing to nature of upper strata of the subsoil risk of settlement of adjacent house property. (d.) Delay in building.

Considering these points more closely we see first as regards the *pros*.

(a.) This point is one of those advanced in the addendum to the report, but the question of compensation to the shop-holders on the line of route during construction makes it open to doubt, more especially as legal aid would probably have to be resorted to in settling the amounts to be awarded.

(b.) This is undeniable.

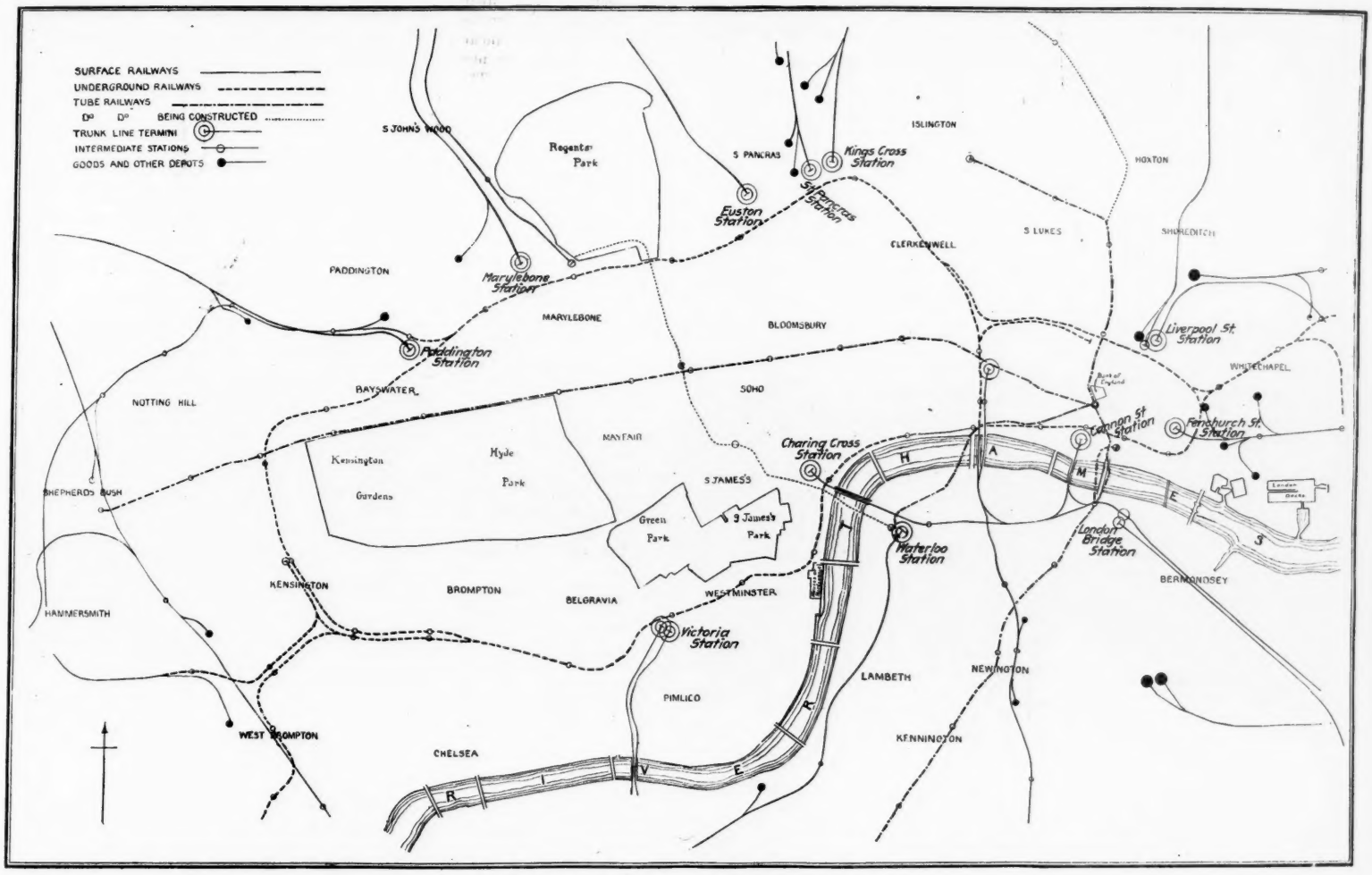
(c.) This also is undeniable.

(d.) A very considerable point in favor, but the above mentioned report runs, 'We were surprised to find no provision for pipes had been made in the subway. In our opinion this could readily have been provided without, in any way, interfering with its use for tramway purposes. A large number of pipes and electric mains were met with during the building of the subway. Those which lay near enough to the surface of the road not to interfere with the subway roof were temporarily supported and afterwards left in their original positions. Others were relaid outside the subway walls." That is in reference to the completed Boston work. Again in reference to this point at New York we read, "The question of providing pipe galleries along the line of the subway was considered by the Commission, and a special report was prepared by the engineer, but we understand that no provision has been made. Many miles of sewers, pipes and cables have had to be diverted, and, in one instance, it has been necessary to build an entirely new outfall sewer over 6 ft. in diameter, and a mile long." In building the American subways, for some reason not given in the report, no advantage was taken of a point which is distinctly urged in favor of these shallow subways. It seems there must have been some serious objection.

(e.) Quoting again from the report. "Then there is the question of vibration. We made very careful inquiries regarding this matter, but could not find there had been a single complaint of vibration. Our own observation certainly supported this." It is unlikely that such vibration as is due to the tubes would be experienced, though considering the difference in the nature of the subsoil in Boston and New York exact comparisons cannot be drawn.

(f.) On this subject the Council officers say: "We were particularly struck with the brightness and airiness of the subway. The air was extremely good and fresh and gave us the impression of being constantly changed. There was no sense of stuffiness, and although the day was hot the temperature inside the subway was pleasantly cool. At the same time, the difference in the temperature was not so great as to be likely to cause chill and discomfort by the sudden change." Nobody who has been in our tube railroads would apply these remarks to their own experience.

(a.) On the other hand: It is difficult to see, in view of the wide and powerful opposition that would certainly be brought against any proposal of this nature on behalf of private and public interests, and the very complex nature of the question of compensation, how Parliament could give their sanction to a scheme at all comprehensive. In the case of the new street now being made by the Council from the Strand to Holborn, the necessary powers have been obtained, though at the time of writ-



The Surface and Underground Railroads of London.

ing no definite decision as to building has been made known.

(b.) At certain times in the day the trams are besieged by men and women, causing much obstruction in the streets where they terminate. The bringing of the trams nearer to the crowded portions of the metropolis might cause similar obstruction where the lines came to the surface. This, however, is a theoretical point which only experience can show to be true or false.

(c.) The treacherous nature of the water-bearing gravel beds which underlie the made ground of the streets render excavating operations very precarious and expensive. The effect of pumping operations upon neighboring buildings can be seen at the present time in Westminster. No mention is made of especial trouble due to this cause either in Boston or New York.

(d.) In Boston the Act required "that all streets or places under or near which a subway is constructed shall be open for traffic between 8 a.m. and 6 p.m." This requirement, which was strictly complied with, necessitated cut and cover work, the work of construction being carried out both by day and night and also generally on Sundays. The London Council at present, in deference to the opinions of some of their members, impose upon contractors certain obligations which militate against rapid progress.

The report mentions three types of subway which were built: The type where the side walls and arches are of masonry, a single wide archway covering the whole subway; (2) two distinct tunnels side by side, built of masonry; (3) upright steel columns and transverse girders for the roof, with masonry and concrete round and between them. The last method was used almost entirely in New York, and it certainly seems the best for rapid building, though in England some difficulty might be found in obtaining steel work in such large quantities, and possibly at comparatively short notice. Roof seats, of course, cannot be allowed, which will mean alteration of most of the existing trams, if through cars are run. Attention is drawn to the sharp curves in the Boston subway, which, according to outside evidence, might have been avoided, and an unfavorable opinion is expressed upon them, but sharp curves would be unavoidable in London if a comprehensive scheme were carried out.

In forming an opinion between the merits of tubes and of shallow tramways we are at a disadvantage, because the tubes have had a thorough trial in London, but in the case of the shallow tramways we collect our data from the experience gained in two cities where "cabs, omnibuses and other vehicles for the conveyance of passengers, except street cars, are practically unknown." Moreover, the value of the report by the Council representatives would have been materially increased if the civil engineering side of the question had been included, ensuring a full appreciation of technical details and difficulties, so that a more mature opinion upon the merits of the scheme proposed could have been formed.

The question then ranges itself under the following broad issues, whether preference shall be given to:

A scheme practically successful, or a scheme theoretically successful here and practically successful in America.

Enterprise of public companies, or that of a municipal body.

Rivalry between disunited schemes, or harmonious control over a united scheme.

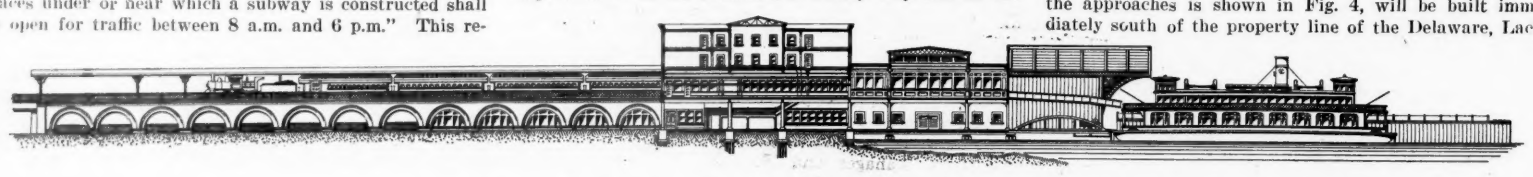
The present method of obtaining powers to build new railroads and tramways is, briefly, as follows:

The schemes have to be deposited, with plan, section, etc., at the Private Bill Office, so that in due course they may be brought before the Parliamentary Committees appointed to deal with them. The authorization by each House of the recommended schemes follows as a matter of course, and the bill becomes an Act.

The great objection to this method of procedure is that the personnel of the Committees is changed each session, and continuity of policy and ideas is not obtained. It is probable that the formation of a similar body to the Light Railways Commission will be recommended, thereby lessening the expenses of promotion, as has been done in the case of light railroads, which no longer come before the Parliamentary Committees with evidence. The need of reform in this particular direction was seen by the London County Council, which last November resolved that inquiry should be made as to "how far it is possible to adapt the provisions of the Light Railways Act of 1896 to underground railroads in London as recommended by the Joint Select Committee of 1901."

New Erie Terminals at Jersey City and New York.

The Erie Railroad is planning extensive changes and improvements in its terminals in Jersey City and on the Island of Manhattan. They have been under consideration for some time and are far reaching in their character. They include a new ferry house on West street opposite Chambers street in New York, in connection with which there will be a modern 11-story office building for the accommodation of all the general offices of the railroad at the northeast corner of Chambers and West streets. A bridge will be built over West street connecting the ferry house with a large waiting room, which will occupy the second floor of the office building. This will do away with the danger to passengers using the ferry in crossing West street during the time of heavy traffic.

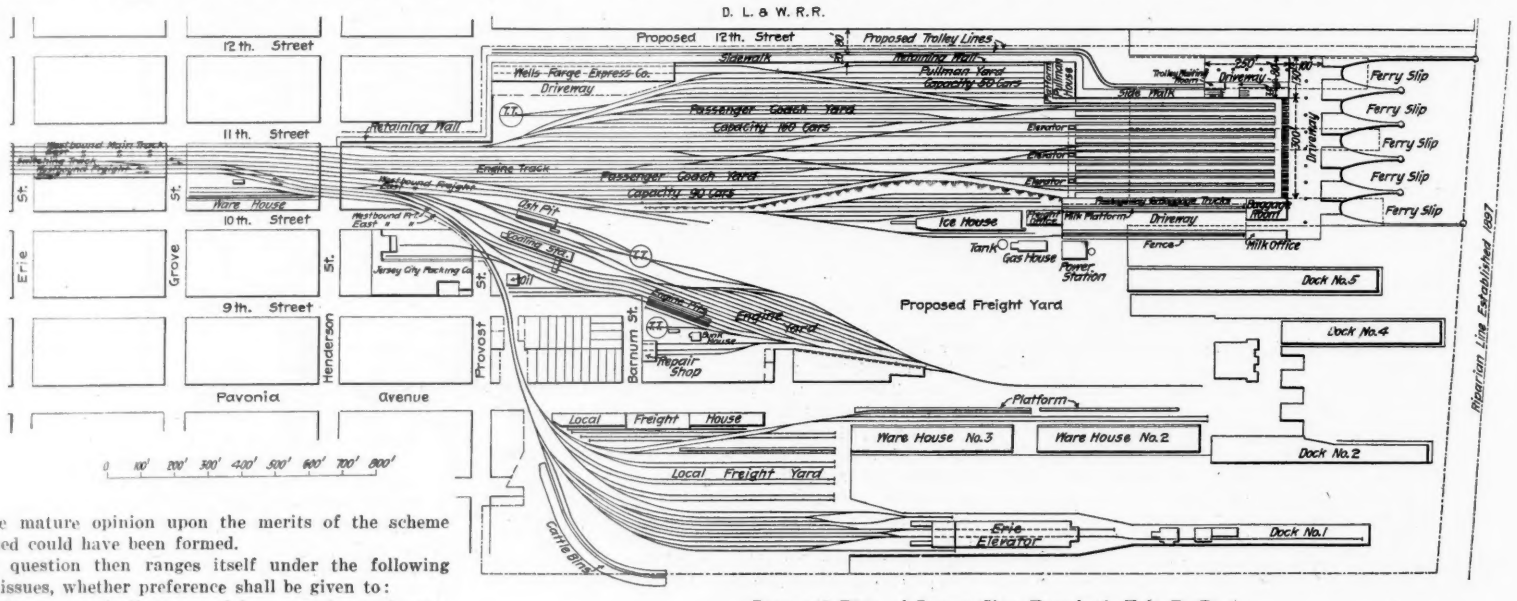


Cross Section of Station and Ferry Slips, Jersey City Terminal, Erie R. R.

At West 23rd street a ferry house will be built, similar in design to the Pennsylvania Railroad ferry at the same point. The general plan and cross section of the Chambers street terminal are shown in the illustrations. Provision is made for double-deck ferry boats, a number of which will be built, and the bridges from the upper deck lead direct to the waiting rooms and ticket offices. The plans for these two new ferry houses are now being made, and they will probably not depart materially from the proposed designs shown in the illustration.

On the Jersey City side of the river, the plans involve a complete re-design of station, tracks and yards, which will give the Erie a modern terminal with ample tracks for both freight and passenger service and leave room for extensions in the future. The chief changes include a new passenger station and a three-track line, exclusively for passenger service, from the terminal through Jersey City and on out to the junction of the Newark Branch, the main line (running to Paterson) and the Northern of New Jersey. This line will parallel the present line. As will be seen from the plan of the station and yards the passenger tracks will at the terminal be north of the freight tracks, and running through Jersey City they will retain this relative position. Starting at Henderson street the new tracks will rise on approximately a 1 per cent. grade. The present embankment, on which the tracks are carried above the streets through the city, will be widened and the retaining walls strengthened, and until the new line reaches Coates street the foundations will be of solid masonry. At Coates street the level will be sufficiently above that of the present tracks to permit of a steel trestle from that point to Bergen hill, under which the present line runs in a tunnel. Just before the high level line reaches the hill it will cross the low level line and run over the hill through a 30-ft. open cut some 80 ft. south of the present tunnel, and thence down to the level of the meadows by a 1 per cent. grade. The present line, including the tunnel under the hill, will be used exclusively for freight. Each of the branches before mentioned and the main line will have a double-track leading to the junction, where all the lines will join the main three-track passenger line into the Hudson River terminal. The new plans also contemplate the entrance into Jersey City of the New York, Susquehanna & Western over the Erie tracks, this line at present running its trains into the station of the Pennsylvania. The passenger trains of the Northern of New Jersey, which parallels the Susquehanna for some distance north of the main line junction, will run on a cross-over to the lines of the N. Y., S. & W., and thence in on the new high level line. The freight trains will use the present route through the tunnel, as will all freight trains on all of the branches.

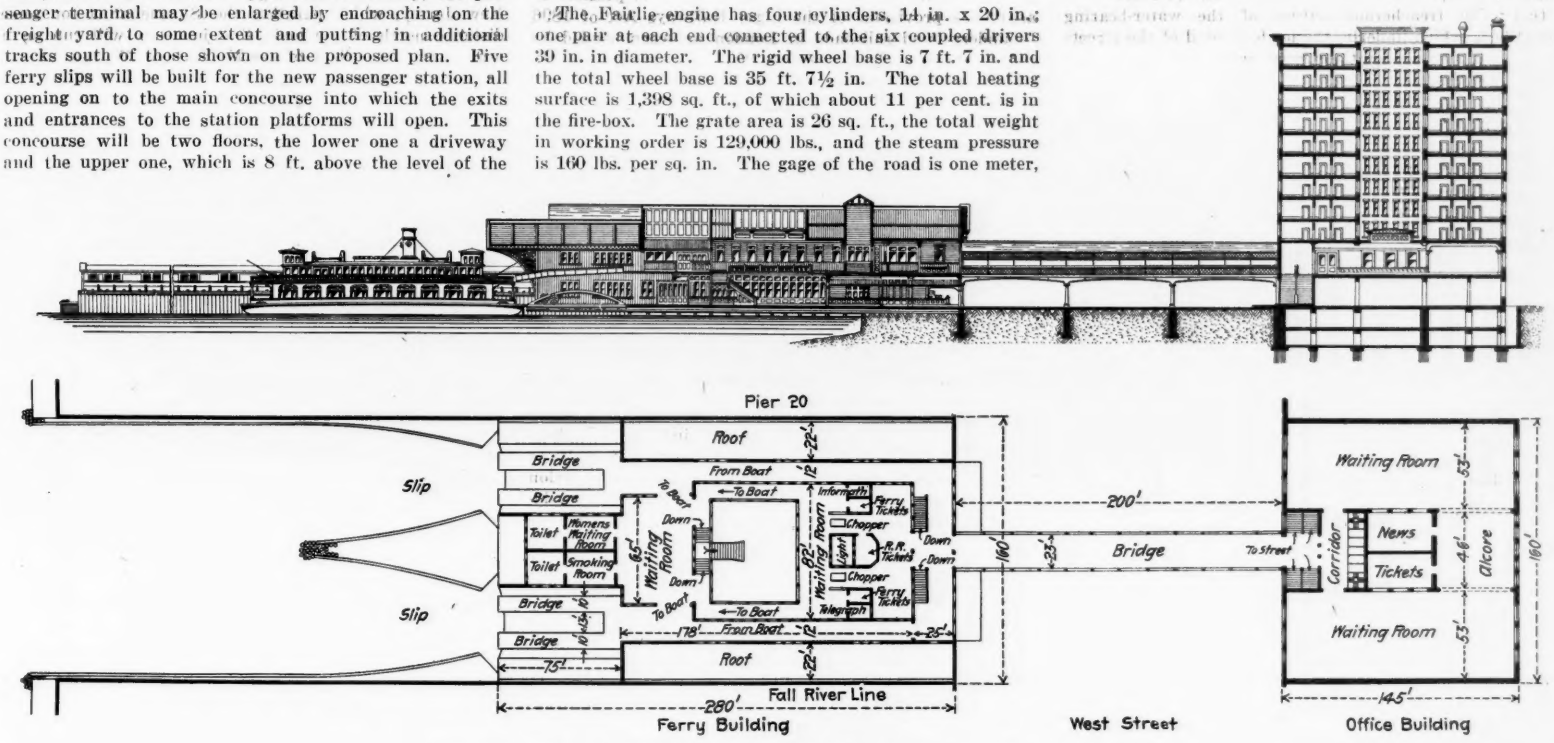
The new station at Jersey City, which is shown in vertical cross section in Fig. 3 and a plan of which with the approaches is shown in Fig. 4, will be built immediately south of the property line of the Delaware, Lackawanna & Western, which extends through the center of 12th street, some 700 ft. north of the present site. It is proposed to open 12th street down to the river front and have the Jersey City entrance for the station on that street. The trolley cars will run into the station driveway on the north side, where a waiting room will be provided for passengers. By the new plans for the station the tracks and platforms are 9 ft. higher than the present tracks. As shown in the cross section the station tracks and platforms will be built over solid masonry arches. There will be 14 tracks and seven platforms for the accommodation of passengers and also two tracks, with a driveway between, just south of the train shed and connecting with the driveway entering the ferry slips, for the accommodation of the milk traffic. Three elevators will be provided at the outer end of the station platforms on which baggage, express matter and mail will be carried up from the storage rooms underneath the train shed. The yard layout has been especially designed to provide for the rapid movement of trains in and out. Thirty-four trains an hour is the approximate number which may be safely handled in the new yard. Coming in from the main line the three tracks connect to two main leads which in turn connect to all of the train shed tracks. The storage yards for passenger cars (including Pullman cars) will have a combined capacity of 300 cars. The Pullman yard, which lies along the north line of the new yards, will have a capacity of 50 cars, and is connected by two leads to the four tracks on the north side of the station, which will probably be used for the through traffic. Just south and extending further west is a large passenger storage yard to hold 160 cars, and immediately south of this but on the other side of the main tracks, is a third storage yard with a capacity of 90 cars. The present engine yard, with the coaling station, repair shop and engine pits will be utilized exactly as it stands, connection being made just beyond Henderson street with an engine track which lies parallel to the main tracks and connects by crossovers as well as by the two main leads to all of the train shed tracks. It will be possible with this arrangement of tracks for the road engine to back the empty train out of the station and part way into the storage yard, where it will be picked up by a switching engine and hauled to its proper place. The road engine will then continue down the main lead on to the engine track and then back down into the engine yard. The track thus vacated can immediately be filled from the storage yard by another switch engine and the outgoing road engine can come down the engine track on to the main lead and so on down to the proper track and couple



Proposed Plan of Jersey City Terminal, Erie R. R.

up to its train with only one crossing of the main track. It will be seen that this arrangement provides a maximum number of train movements with a minimum amount of probable delay owing to the switches being open on the main tracks.

The space now occupied by the present passenger terminal will be transformed into a new freight yard and the present ferry slips utilized as freight docks. At any time, however, when it may become necessary, the passenger terminal may be enlarged by encroaching on the freight yard to some extent and putting in additional tracks south of those shown on the proposed plan. Five ferry slips will be built for the new passenger station, all opening on to the main concourse into which the exits and entrances to the station platforms will open. This concourse will be two floors, the lower one a driveway and the upper one, which is 8 ft. above the level of the



Plan and Section of Ferry House and Office Building at Chambers St.—Erie R. R.

station platforms and approached from them by stairways, being exclusively for the use of foot passengers, who will board the ferry boats from the upper deck.

The plans are at this time in a preparatory stage, but little having been definitely decided upon. The general scope of the work, however, will probably be very much the same as above outlined. With these increased facilities the Erie Railroad will have an excellent terminal for the City of New York. The work will probably require two years for its completion and also the expenditure of large sums of money; but this expenditure will undoubtedly be justified by the greater ease and certainty with which the rapidly growing business, both freight and passenger, of the Erie Railroad may be handled. We are indebted to C. W. Buchholz, Chief Engineer of the railroad company, for this brief description of its proposed improvements.

A Few Foreign Locomotives.

The accompanying engravings show four locomotives recently built by the Vulcan Foundry, Limited, Lancashire, England. The locomotive, Fig. 1, is recognized as the well-known Fairlie type and has been built for the Burma Railroad. This type was widely exploited about 30 years ago and was the subject, at times, of a somewhat acrimonious discussion. It was claimed that this construction was particularly adapted to narrow gage railroads, the reasons being that the total weight of engine was utilized for tractive adhesion without severe concentrated loads, and the total wheel base was much longer than would otherwise be possible, thus making a very flexible engine. Only one of these engines was used in this country, but a number were sent to Peru for service on the Iquiqui railroad. One was built by the Mason Machine Works at Taunton, Mass., in the early 70's, and after holding it in stock for about 18 months it was sent to the Lehigh Valley for trial. It was not considered successful.

The Fairlie engine has four cylinders, 14 in. x 20 in.; one pair at each end connected to the six coupled drivers 39 in. in diameter. The rigid wheel base is 7 ft. 7 in. and the total wheel base is 35 ft. 7½ in. The total heating surface is 1,398 sq. ft., of which about 11 per cent. is in the fire-box. The grate area is 26 sq. ft., the total weight in working order is 129,000 lbs., and the steam pressure is 160 lbs. per sq. in. The gage of the road is one meter, or about 3 ft. 3⅜ in. The tank capacity is 500 Imperial gallons and the fuel space holds two tons of coal.

The Great Central locomotive, Fig. 2, is the design of Mr. J. G. Robinson, Chief Mechanical Engineer of the road. The wheel arrangement is the 4-4-2, or Atlantic-type, but the fire-box is not extended over the frames as is the usual practice in America. The cylinders are 18 in. x 26 in. The drivers are 67 in. in diameter, the total weight is 151,080 lbs., and the heating surface is 1,065.03 sq. ft., about 11 per cent. being in the fire-box. The grate area is only 19.85 sq. ft. The fire-box is copper and the tubes are 1¾ in. external diameter and are bell mouthed for 3 in. at the smoke-box end to $1^{13}/_{16}$ in. diameter. The working steam pressure is 160 lbs. per sq. in. and the boiler is 10 ft. 10 in. long. The engine is for standard gage. In many respects the general dimensions are the same as the standard eight-wheel passenger engine used in America about 15 or 20 years ago.

Fig. 3 shows a locomotive built for the Western Australia Government Railroads. The wheel arrangement is the 4-6-2, or so-called Pacific-type. The cylinders are 17 in. x 23 in. and the drivers are 54 in. in diameter. The total weight in working order is 114,700 lbs. and the total heating surface is 1,418 sq. ft., the fire-box containing 118 sq. ft. The grate area is 19.3 sq. ft., which is about the same as that for the Great Central locomotive described above. The working pressure is 175 lbs. per sq. in. The tender is the 8-wheel type and holds 2,200 gallons of water and 4½ tons of coal. The gage of the road is 3 ft. 6 in.

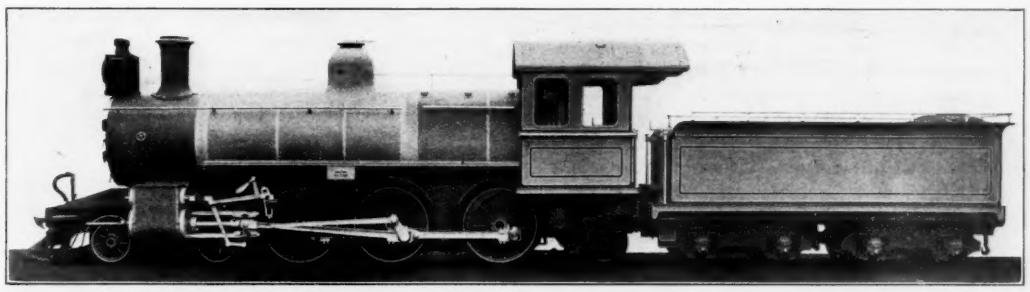


Fig. 3.—Locomotive for the Western Australia Government Railroads.

The last engine of the group, Fig. 4, is for the Bombay, Baroda & Central India, and has six coupled drivers with a trailing wheel behind, making the wheel arrangement virtually a Mogul when running backwards. The cylinders are 18 in. x 26 in. and the drivers are 61 in. in diameter. The rigid wheel base is 16 ft. 5 in. The total weight in working order is 125,840 lbs., and the heating surface is 1,272 sq. ft., about 114½ sq. ft. being in the fire-box. The area of the grate is 23 sq. ft. The tank capacity is 1,100 gallons, and the fuel space will hold about 2¾ tons. The gage of the road is 5 ft. 6 in.

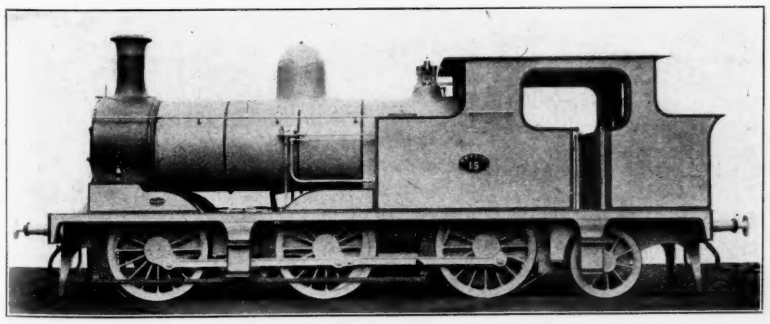


Fig. 4.—Locomotive for the Bombay, Boroda & Central India.

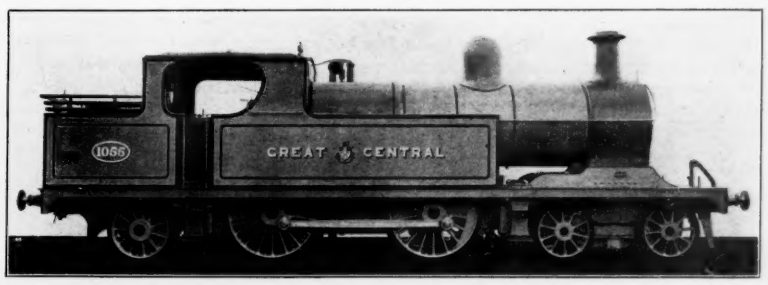


Fig. 2.—Atlantic Type Locomotive for the Great Central.

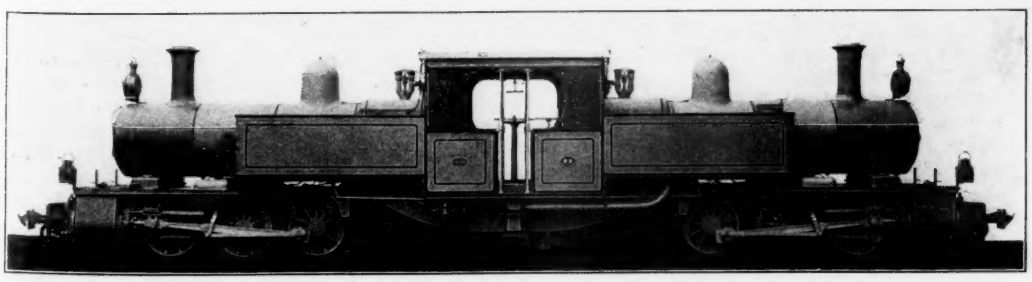


Fig. 1.—Fairlie Locomotive for the Burma Railroads.

The railroads of England, acting through the Railway Companies' Association, have reduced their rates for carrying bicycles on passenger trains, and will henceforth insure wheels against damage, to the extent of 10 shillings, on the payment of an insurance fee of one penny. The rate for transportation will be 6d. (12 cents) for 25 miles, 1 shilling for not exceeding 50 miles, 2s. 6d. for 150 miles, etc.

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President Hall, of the New York, New Haven & Hartford, says that many of the larger receivers of freight in Connecticut have assented to the proposed law reducing the free time for unloading cars from four days to two days and imposing a charge of 20 cents each for the third and fourth days; but it is expected that opposition will be encountered in the Legislature from the farmers. In telling what is going to be done to improve the freight-car situation President Hall names two remedies which will work in opposite directions. One is the building of warehouses and the other is an increase in the supply of freight cars. A large cotton shed is to be built at Fall River; this is commendable. The storehouse is the only rational remedy; but to build more cars may conceal the losses incident to delays in unloading, without preventing them. The New Haven has ordered 4,000 new freight cars. These can be sent West in return for cars borrowed from connecting railroads and thus the item of $700,000 a year, paid to other roads for car hire, will be partly offset by receipts for cars lent; but the essential waste—the use of a car as a storehouse—cannot be thus easily done away with. The larger the supply of cars the greater the temptation to make wasteful use of them. Mr. Hall says that, pending action by the Legislature, the company will adopt every possible means at all stations to expedite the unloading of cars. It will be of interest to learn what this means consists of. The wicked railroaders outside of Connecticut who lend cars to the New Haven road would probably say that where four days' free time is compulsory, the only means adapted to the purpose would be a rate of four or five dollars a day, beginning with the fifth day; but as the New Haven has been pretty lenient with its customers in the past we can hardly expect that anything so radical as this will be attempted.

The New York Central's proposed electric terminal in New York city is now authorized by the State Legislature in form and in substance as it was previously agreed to by the company and by the city authorities. It is a satisfactory political recognition of the principle of local government and a tribute of respect for the recommendations of the officers of the company, who now have to solve in detail a series of problems that have never before been seriously considered on a scale of such magnitude. Its size is its difficulty. It necessarily involves the making of a new locomotive division, operated by electric locomotives from the terminal to some point outside the city. Albany is too far away and local conditions prevent the making of a division point anywhere near the city limits. The weights and required speeds of the through trains over this electric division differ greatly—from the 4-car train of the Empire State to the 17-car limited trains mostly made up of heavy Pullman cars. It is for the scientific commission, of which Mr. Wilgus is the head, to find a way to do this varied work simply—possibly a standard electric locomotive unit, capable of handling the lighter trains, and with two or more coupled and under one control for heavy trains. The separation of the through passenger service from the suburban trains is already provided by the engineer's plans for different surface levels at the Grand Central station, and it would seem natural to use motor cars exclusively for the suburban service, so that the wonderfully attractive region immediately north of the city—the foothills of the Berkshires—can be reached by trains as frequent as those on the elevated road. In all this it happens that the New York Central is called upon to be a pioneer, and it is fortunate that its officers and its commission are impressed with the dignity and importance of the work they have undertaken and which will set the pace for all other roads with great city passenger terminals.

The distressing collision at Red House, N. Y., last Monday morning, reported in another column, was due to three causes; that is to say, three remedies will be prescribed. Nearly everybody will say that all three remedies should be adopted; but each one of three typical classes of men will put a different remedy first. The English signal engineer will say that it is useless, and even absurd, to think of working the block system while leaving an important switch unconnected with the cabin. If the Red House signalman had had control of the switch at the east end of the side track, he would not have depended on the assumption that the freight had passed it; he would have waited for knowledge. Control of switches a long distance from a cabin is not only well known; the Erie is one of the roads where this safeguard was first put in use. The significance of the opinion of our supposed English signal engineer lies in the fact that all England, railroad men and Board inspectors, agree with him. With the Government official (American or English) and the sociologist, if he ever gets down to such a prosaic matter, the first remedy will be to forbid the employment of boys for such grave responsibilities. It is true that many a boy of 18, or even younger, does brilliant work in a telegraph office, and that in a year and a half a thousand things can be learned. But there must be a limit somewhere to youthfulness, and what more rational limit than the age of 21? The practical effect of this would (or should) be to compel a longer period of apprenticeship in signal cabins and telegraph offices, and perhaps a higher average rate of wages. There can be little doubt that this longer apprenticeship is an important element in the safety-record of the English railroads. If a Government authority were to prescribe a youth-limit it would not be likely to set it below 21; and if influenced by the trade union spirit might make it higher. At all events, the lower the limit the greater the responsibility on the railroad company to show that new men are thoroughly trained. The third arrangement of remedies would be by the American superintendent. He would say that the flagman who failed to stop the passenger train was chiefly responsible; the flagman's conduct must be corrected. We do not pretend to pick out the superintendent who holds this view; but the view is a logical result of our way of working the block system. We keep up the old idea of depending on the flagman, instead of making the most of the block system. Why did not this flagman aim to get the block signal set against the passenger train instead of depending on his hand lantern? We do not know; but the general practice furnishes a perfectly intelligible hypothesis. There being a fog, the question arises why he did not use torpedoes or fusees; but the discussion of this only leads to the same conclusion that has been reached a thousand times already—that the flagging system cannot be depended on. In depending on the block system *and* flagging we run the proverbial risk of the man who tries to sit on two stools. There is one other comment: Automatic block signals, operated through a track circuit, would have given the warning needed to prevent this accident.

Fuel Oil for Locomotives.*

"There is good reason for believing that the wells are not likely to be soon exhausted and that an ample supply can be assured for an increased demand of the future." This is quoted from the report of the "Liquid Fuel" board of the Navy. Many railroads in the Southwest whose lines are contiguous to the newly discovered fields in Texas and California have spent large sums in adapting their locomotives to the use of oil fuel and in building pipe lines, tanks, and other facilities, and the above assurance of a continuous supply is at least encouraging. It must not be assumed, however, that the use of oil will become general throughout the country even though the supply in the Southwest is unlimited. Beaumont oil was recently quoted at $1.26 a barrel in St. Louis, of which $1.05 was for transportation and 21 cents for the oil, so that, after all, the important factor is the actual cost at the delivery point. Tests made on the Santa Fe Pacific show that .1586 lbs. of oil is consumed per ton mile in freight service. Under like conditions and in similar service .3537 lbs. of coal was burned per ton mile. In other words, one pound of oil is equivalent to 2.24 lbs. of coal, a figure which agrees well with other and earlier tests. These figures give a basis for computing the relative cost of coal and oil. A barrel of oil weighs 319 lbs. and is, on the above basis, equivalent to 319 x 2.24 = 715 lbs. or .28 ton of coal. If then coal is worth $3 a ton in St. Louis, it is evidently unprofitable to pay more than .28 x 300 = 84 cents for a barrel of oil, unless the incidental economics warrant its use.

Aside from its higher calorific value, oil has other advantages over coal. By its use the cinder nuisance is averted. The ejection of sparks from the locomotive stack is not only a menace to property along the right of way, but it also represents a considerable loss of fuel. Tests reported by Professor Goss on the Purdue experimental locomotive show that under certain conditions of draft and rates of combustion the fuel lost in the form of cinders may be 25 per cent. of the total coal burned. The cost of handling oil as compared with coal, the absence of ashes, the reduction of time required for turning the locomotive at terminal points, and the ease with which it may be fired up are also items that favor liquid fuel. With a proper design of burner and a combustion chamber of ample size, it is possible to more easily regulate the boiler pressure with oil than with coal and thereby reduce the losses at the safety valve, which in many cases are considerable. There is truth in the statement that "the size of the locomotive has increased at a greater rate than the size of the fireman," or, stated in another way, the amount of fuel burned by a modern locomotive is in excess of the quantity that can be shoveled into the fire-box by one man. A locomotive with 5,000 sq. ft. of heating surface when working at maximum power will evaporate about 75,000 lbs. of water an hour, which represents a coal consumption of about 10,700 lbs., or more than 5 tons. Even if two firemen are employed, it is questionable if efficient combustion is possible under these conditions. On the other hand, the use of oil can be controlled merely by the turning of a few valves and the amount of fuel burned is easily and quickly regulated to meet the varying demands for power. By keeping close watch on the character of the smoke, it is possible to always maintain practically perfect combustion.

The first experiments with oil fuel for locomotives were made in France in 1870. The grate bars were inclined and the oil flowed down grooves in their upper surfaces and was burned in the same manner as coal, the air coming up through the grate. It was impossible to burn enough oil to maintain the necessary rate of evaporation. Subsequent tests have shown that it is essential that the oil be reduced to a finely divided state and atomized before ignition. Many forms of burners have been invented, but the Navy experts have found that so long as the atomizing is complete, there is no advantage of one form over another. The important factors are the length of furnace, the volume of the combustion chamber and the extent of heating surface in the boiler. The use of heated air instead of steam for atomizing the oil also shows decided economies, and if steam is used it should be at a high pressure and superheated, if possible, to remove the moisture. Coal burning locomotives that have been converted into oil burners are sometimes found to be deficient because the boiler cannot be forced to the required rate of evaporation. A larger combustion chamber is required for oil than for coal if the same results are to be obtained with both fuels. The Vanderbilt boiler, by reason of its long fire-box and ample flameway, is claimed to be especially adapted to the use of oil. A number of new oil burning engines have been built on this principle within the last two years and are said to give good results. Another design, known as the Player-Baldwin, has been developed for the Atchison, in which the fire-box is composed of three cylindrical tubes 32 in. in diameter and 86½ in. long, which terminate in a cylindrical combustion chamber about 60 in. in diameter and 40 in. long. There is an oil burner in each of the smaller tubes. The boiler of this particular engine contains

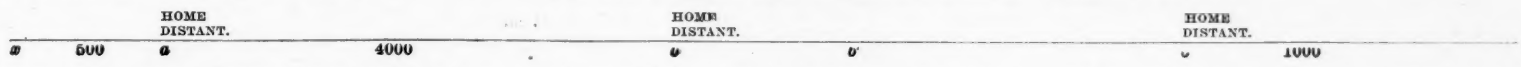
*For drawings and description of the Player-Baldwin Locomotive, see *Railroad Gazette*, Dec. 20, 1901.

4,265 sq. ft., of which 5½ per cent. is in the fire-box. From theoretical considerations the design appears to be ideal for oil burning.

It is suggested that the use of oil may increase the danger from fire in case of accident. The danger would seem to be in the scattering of oil over the wreckage and thereby accelerating the burning when once started. Against this argument it can be said that the use of oil diminishes the liability of starting fire by this much: when the connection between the tender and engine is broken, the fire goes out. It is true that the fire bricks are hot enough to set fire to wood or other imflammable material, but it is improbable that they would be thrown from the fire-box. There are many records of disastrous fires having been set by the scattering of the hot coals from the fire-box of a wrecked locomotive.

The Overlap.

Overlap is the term used in automatic block signaling to designate the arrangement by which a train does not clear the home signal at *a* when it passes out of the block section at *b*, but does clear signal *a* when the train passes *b'* (600 ft. to 3,000 ft. beyond *b*). This is accomplished by arranging the track



circuit relay at *b* so that the track circuit *a b* is kept open until the train passes *b'*.

The strong argument offered at the last meeting of the Railway Signaling Club in favor of having an overlap in automatic signaling is that English practice with manual signals amounts to the same thing; that is, they show a red signal at *a* until the train is well into the next block at some point *b'*. The Board of Trade inspectors censure a road that fails to allow such leeway to the following train. The overlap was originally designed for American automatic block signaling practice with home signals only, and as a cheap substitute for the more costly distant signals. The English overlap is used with the distant signal.

The American Railway Association's rule No. 319, for manual block signaling, that *b* must not tell *a* that section *ab* is clear until the train has passed a considerable distance beyond *a*, is plainly using the overlap idea, but this rule was made years ago, when distant signals were few. A common distance for this leeway is 300 ft. The sum of the arguments of those at the Club meeting in favor of the overlap was that the engineer is, like all human beings, fallible; that he might run by one signal without noticing it, and that the overlap would give him a second chance.

The overlap is unscientific, because it gives inexact information to the engineman of a following train. The signal at *a* may be against him, but he may have reason to believe that the preceding train is not in the block ahead of him; it is probably in the overlap. Because of the indefiniteness of the overlap, and because he must make his time, he takes chances. After long experience he finds that he has always correctly guessed when it was safe to run by and when to stop at a red signal, and his state of mind is ripe for a rear-end collision; for one of those inexplicable cases where a trained man with a splendid record "runs" a signal and crashes into a train ahead.

Those opposed to the overlap evidently thought that if the division superintendent would watch and rigidly discipline his enginemen, their alleged inability to maintain a vigilant lookout for all signals, and to invariably stop where stop is indicated, would vanish. To put a stop signal at one point, when the arrangement of apparatus is such that the actual stop may possibly be made at a point farther on, is to weaken discipline. The advocate of the employment of discipline instead of the overlap is likely to have the constant aid of the man or men who make the appropriations. The introduction of the overlap increases the cost of apparatus and of maintenance, and an officer may wisely prefer to spend that money —if any additional money is needed—in enforcing discipline.

Again, the opponent of the overlap objects to it on account of the difficulty of making it simple and uniform. It is confessedly unnecessary when all trains run at moderate speed, and so the question of speed is considered when deciding whether to use or not to use it. But different trains run at different speeds and precise rules are difficult. To make long overlaps on descending grades and short ones on ascending is only an approximate adjustment.

The overlap is an addition to the practicable length of the block sections, and this decreases the capacity of the road. With block sections 4,000 ft. long and distant signals 4,000 ft. back of the homes a fast train must keep 8,500 feet behind a preceding train; for the distant signal at *a* is not cleared until the foremost train has reached *c*. The following train must have notice at *x*, for the engineman needs 500 ft. in which to see the signal at *a*. The time interval between the trains, which measures the capacity of the road, corresponds to the interval between their respective engines. This is 8,000 ft., + the length of the leading train. We may assume the length of the train to be 500 ft. If, now, we add an overlap of 1,000 ft., the former capacity of the road is decreased by the ratio of 9,000 to 10,000, or practically 10 per cent.

Mr. Sperry said that to go without the overlap was to declare a strong confidence in our discipline. Conversely, to adopt it is to admit a weakness in the discipline. If we adopt it we are not in accord with the action taken by the American Railway Association a few years ago when it abandoned the five-minute allowance for possible variation of watches. That allowance was meant for variation in the mental capacity and habits of the men as well as for imperfections in the mechanism of watches; and doing away with it meant an increased confidence in the discipline. That increased confidence appears to have been justified.

These seem to be the chief scientific and economic elements of the question of using or not using an overlap in automatic signaling where home and distant signals are provided. It is the sort of question that needs to be settled almost entirely by discussion, because the evidence obtained by practical use is uncertain. Only two important roads appear to have put the plan in use. The New York Central's Fourth Avenue tunnel has 800 ft. overlaps, and trains run 24 miles an hour. The Chicago, Milwaukee & St. Paul has 1,000 ft. overlaps for blocks 2 to 3 miles long, and 600 ft. blocks of 1½ miles. Both examples, therefore, indicate a disposition to make the overlap as short as practicable.

"Small Unit, Direct Transit."

This is Mr. John Brisben Walker's descriptive name for his method of carrying passengers in great cities, applicable alike to Chicago, New York, London and small towns. He is president of the Mobile Rapid Transit Company, and he tells the New York Rapid Transit Commissioners that the subway, now only about half done, is already antiquated, and asks them to advance $10,000,000 for putting in service automobiles, each seating 14 passengers. Every part of the city could be served because the carriages would not have to keep to certain lines of tracks and "the daily journey down or into town instead of being a horror, composed of bad air, indecent crowding, stopping and jamming at every corner, and clinging to straps will become a pleasure trip and be looked forward to as the most delightful event of the day. The time is as surely coming as you are sitting here when this method of transsit will become universal." He estimated that 5,000 "Mobile" carriages will bring in a profit of 114½ per cent. on the investment, the fares to be from 3 cents to 10 cents, according to distances.

In 1885, Jacob Sharp, a promoter with a creative imagination, but an insufficient distaste for corruption, substituted surface cars for omnibus "units" on Broadway, New York. Right minded citizens were moved to indignation at his methods and an enormously increasing number of all kinds were moved to destination by his achievement, while at the same time street congestion was relieved. It is not easy to recall any fact in the art of transportation more clearly and repeatedly demonstrated than that an orderly procession of vehicles on a track, or of men on march, has greater capacity than any movement of uncontrolled units. One familiar with upper Wabash avenue and State street, in Chicago, or with any avenue in New York between 5 and 6 in the afternoon, needs few figures to picture the results of substituting automobile stages for the existing means of riding, or of adding automobiles to the present systems. Nevertheless an application of the antiquated forms of arithmetic and horse sense may help in the details of the picture.

The subway may reasonably be expected to carry three-quarters of a million people a day on long trips up or down the island. Mr. Walker's 14-passenger automobile will do well to make four such trips a day, "weaving in and out and not keeping to certain lines." It is easy to see that 13,000 automobiles are needed and that the cost of them would be something like $40,000,000—nothing to frighten one, as things go nowadays, but still it happens to be about the estimated cost of the tunnel and all of its local and express equipment. But the tunnel takes none of the present street room, while Mr. Walker's solvent, packed solidly together with no leeway for movement, is about five miles long.

The really attractive feature of the proposition to the Rapid Transit Commission is the 114½ per cent. profit, which, like all gall can be divided into three parts: 4½ per cent. for interest, 10 per cent. for promotion, and the rest for the idea.

March Accidents.

The condensed record of the principal train accidents which occurred in the United States in the month of March, printed in another column, contains accounts of 37 collisions and 22 derailments. Those which were most serious, or which are of special interest by reason of their causes or attending circumstances occurred as follows:

*9th, Olean, N. Y. 31st, Waterbury, Conn.
*†26th, Lacosti, Tex.

The cause of the break-in-two at Olean is not reported, and apparently was not discovered, so the terrible list of fatalities can only be classified in a general way. As the explosion occurred some seconds after the collision the Superintendent will probably think that he is particularly unlucky to be obliged to charge the deaths to the train-accident record at all. But, without knowing the cause, there is no difficulty in naming the preventive; it is the use of the automatic air-brake throughout every train. The killing of 15 persons will accentuate the need of the universal use of the air-brake, but the existence of the need should already be familiar enough, from the common knowledge of the way the bills for damage by break-in-twos increase year by year. According to the Government report for the last fiscal year (Accident Bulletin No. 4, page 11) nearly half a million dollars was charged to this class of accidents in that year, to say nothing of the deaths and injuries and the large sums of money paid out on account of them.

The rear collision of passenger trains at Lacoste belongs to a class which is so familiar that no reader of these columns will need an essay on the causes at this time; but it will do no harm to look again at the fact that the rear car of the foremost train was *not* the one that was wrecked. The oil in the tender and the burning of the bodies of the passengers killed are other significant features of the report. Another feature, which has appeared a number of times in recent accident reports, is the empty rear car. To adopt an Hibernicism, several hundred passengers have saved their lives by not riding in rear cars; that is to say, railroad horrors have been considerably lessened in the last few months by the lucky chance that certain careless enginemen were running behind passenger trains which happened to have an empty car at the tail end.

The wrecking of a handcar by a locomotive is an accident which occurs every now and then, but is not included in these reports. In March there was an accident of this kind (near Ithaca, N. Y.,) which was out of the ordinary in that the occupants of the hand-car were passengers, who had to leave their train because of a landslide. The locomotive was running fast, there was a dense fog, and one passenger was killed and another fatally injured.

The number of electric car accidents reported in the newspapers in March was 15, in which two persons were killed and 59 injured.

Electrical Reduction of Iron.

[Students will be interested in G. Garnier's account of all the processes, and references to the literature of the subject, published in full in the March, 1903, issue of *Le Mois Scientifique et Industriel*, Paris.]

Electrolysis in a highly heated solution is possible by a method similar to that used in the production of aluminum, but Mr. Gin shows that by this method the production of one ton of iron will require 20,000 h.p. hours! He believes these figures to be well grounded.

There only remains the possibility of reducing the ore in the presence of carbon, using the electric current to produce the necessary heat. It may be assumed that the production of one ton of iron requires 2,300,000 calories, which, allowing an efficiency of 75 per cent. for the apparatus, means an expenditure of 3,800 kilowatt-hours. At first sight this appears to reduce the problem to the question of obtaining the current at a sufficiently low price. Account must, however, be taken of the cost of the electrodes which are consumed and which amounts to from $3.40 to $3.80 per ton of iron produced, and further it must be borne in mind that coke is necessary for the reduction, and that this is rarely obtained cheaply in mountainous countries offering favorable hydraulic conditions for the cheap production of the electric current. It may be estimated that the three prime factors in the cost of production will be approximately as given below for each ton of metal produced.

Electric power, 5,092 h.p. hours at .112c.	$5.70
Coke, 880 lbs. at $7.60 per ton	3.04
Electrodes	3.61
Total	$12.35

Without going further it may be concluded that the direct production of iron or steel from the ore by the electric process can only have a future in a country barren of mineral fuel and lacking transportation facilities, but blessed with water power and ore; while it is not commercially practicable in a civilized country producing coal and offering means of transport.

Although the direct production from the ore appears to be out of the question, it may be practicable to employ electricity for the heating of open-hearth furnaces for the production of steel. The conditions under which this can be done are not difficult to determine. The current will be used only for melting the pig iron and maintaining the bath at a high temperature during the conversion from

iron to steel. The heat energy thus expended per molecule of Fe (56 grs.) is shown below.

Heating to 1,200 deg. C. (approx.), gramme calories	11,600
Heat of fusion (approx.), gramme calories	5,200
Htg. from 1,200 deg. to 1,800 deg., gramme calories	13,200
Total, gramme calories	30,000

From this it follows that the expenditure of heat for the production of a ton of steel is given by an expression of the form $Q = 535{,}000 + F + K$ where K is the negligible amount of heat required for the reactions during conversion and F is a function of the time of the operation and of the temperature. For practical purposes the quantity of heat Q may be taken to correspond to an expenditure of from 1,300 to 1,400 kilowatt-hours, and if the open-hearth furnace be fed with molten metal from a neighboring blast furnace this can be reduced to about 600 kilowatt hours. This brings the metallurgic use of electricity well within the range of commercial possibilities, the electricity being produced not by hydraulic power but by gas engines using the waste blast furnace gases. Under these conditions a group consisting of a blast furnace supplying pig iron to a Bessemer converter for ordinary steel, and to an electric open-hearth for high grade steel, would give an economical utilization of the energy from the coal which would be beyond anything which has yet been accomplished.

Foreign Railroad Notes.

The United States Consul at Niuchwang, China, reports that a through passenger train is now run once a week over the Siberian Railroad between Moscow and Dalny. The time through is 13½ days.

Regular service over the Chinese Eastern Railroad between Port Arthur and stations on the Siberian Railroad began Feb. 27, when a train with second and third-class cars was despatched from Port Arthur for Lake Baikal. A few days later first-class cars were to be put on. The few passages theretofore had been by special or construction trains.

Train robberies have ceased to be a monopoly of this country, and are so common in certain parts of Russia that the Ministry of Transportation has taken special measures to prevent them. A Russian journal reports that within the last three years there have been 1,181 attacks on trains or criminal attempts to wreck them, and 286 armed attacks, resulting in robbery or murder. Most of these were on the Vladikaukaz line, leading through southeast European Russia to the foot of the Caucasus, on the Asiatic Midland, east of the Caspian Sea, both of which pass through territory largely occupied by wandering hordes, including many who have followed robbery, cattle-lifting, etc., as a profession for centuries; and in Siberia, which till recently was largely peopled by thieves banished from Europe. Much the larger number of attacks have been east of the Caspian Sea. A force of mounted police is to be established north of the Caucasus and east of the Caspian, and a secret police in the settlements near the railroads, by whose inhabitants the attacks are usually made. Further, provision is made for the immediate trial of those arrested, and police powers are given to certain of the higher classes of railroad employees; and train and station men on the Siberian and the Chinese Eastern Railroad will be armed. Further, better wages are to be paid to trackmen and laborers, who, apparently, are suspected in some cases of assisting the robbers and getting a share of the plunder.

Train Accidents in the United States in March.[1]

rc, 1st, Chicago, Burlington & Quincy, Stoddard, Wis., a freight train ran into the rear of a preceding freight, wrecking the caboose and one car. The wreck took fire and was partly burnt up. The conductor was fatally injured.

bc, 2d, Missouri Pacific, Fort Scott, Kan., butting collision between a passenger train and a freight, damaging both engines and many cars; 20 passengers and one trainman were injured.

*unf, 2d, Baltimore & Ohio South-Western, Lebanon, Ill., a freight train was derailed at a misplaced switch and the engine was overturned. Eleven cars were piled up in a wreck and were partly destroyed by fire. The fireman and a man learning the road were killed and one brakeman was injured. It is said that the switch was maliciously misplaced.

xc, 4th, 10 p.m., Chicago, Rock Island & Pacific, Armourdale, Kan., collision of passenger trains, one of which was entering a side track. One smoking car was wrecked and 19 passengers were injured.

unx, 4th, Seaboard Air Line, Yulee, Fla., a northbound passenger train was derailed at a switch which it is believed had been tampered with. Two trainmen and one passenger were injured, the trainmen fatally.

xc, 5th, Pennsylvania Road, Scottdale, Pa., a freight train broke in two and the rear portion afterwards ran into the forward one, badly damaging 10 steel cars and several wooden ones. Two trainmen were injured, one of them fatally.

bc, 6th, Rio Grande Western, Salt Lake City, Utah, butting collision between a passenger train and an empty engine; three trainmen and two passengers injured. There was a dense fog at the time.

unx, 6th, Missouri Pacific, Boone, Colo., the engine of a passenger train was derailed at a frog and fell against some freight cars standing on a side track. Five trainmen and one passenger were injured.

xc, 7th, Cumberland Valley, Falling Waters, W. Va., a freight train broke in two and the rear portion afterwards ran into the forward one, wrecking several cars. One trainman was killed.

dn, 8th, Pennsylvania Lines, Shenango, Pa., the locomotive of a freight train was derailed at a derailing switch and fell down a high bank. The engineman, fireman and one brakeman were severely injured.

unf, 8th, Louisville & Nashville, Siluria, Ala., a passenger train was derailed at a washout and a mail clerk was killed.

bc, 9th, Atlantic Coast Line, Dunnellon, Fla., butting collision; one trainman and one other person injured.

*9th, 9 p.m., Erie road, Olean, N. Y., a freight train broke in two and the rear portion afterward ran into the forward one, doing slight damage. A tank car containing oil or gasoline exploded and 16 persons were fatally and 28 others less severely injured. The first 22 cars in the train were air-braked; the coupling failure occurred behind the 22d car.

10th, Pennsylvania road, Oil City, Pa., a passenger train ran over a misplaced switch and into the rear of a freight train on the side track, badly damaging the locomotive and several cars. Three trainmen and five passengers were injured.

10th, Pennsylvania road, Beaver Springs, Pa., a freight train ran into the rear of a preceding freight, wrecking the caboose and badly damaging the engine. The caboose took fire and a brakeman imprisoned in it was badly injured; nine cars were wrecked.

bc, 10th, Southern Railway, Danville, Va., butting collision of passenger trains, within the yard limits. One passenger and one employee were killed. Several passengers were injured.

bc, 10th, Chicago, Rock Island & Pacific, Agate, Colo., butting collision of passenger trains, badly damaging both engines. One engineman and a boy stealing a ride were injured.

unf, 10th, 4 a.m., Missouri Pacific, Gasconade, Mo., a passenger train was derailed and overturned at a point where the track had been broken or distorted by a rock which fell from a high bank. The engine and three cars were overturned. The engineman and fireman were injured.

bc, 11th, Louisville & Nashville, Rankin, Ky., butting collision between passenger train No. 51 and freight train No. 74. Four trainmen were injured, one of them fatally. It is said that the passenger train passed the appointed meeting station six minutes before the hour fixed by the train despatcher. The freight train had got part way into the side track.

xc, 11th, 8 p.m., Colorado & Southern, Beshoar, Colo., a freight train backing into a side track was struck near the front end by a passenger train, which approached on the main track, and both engines were badly damaged. The passenger fireman was killed and one engineman and one fireman were injured, the former fatally.

12th, 1 a.m., Great Northern, Essex, Mont., collision between a passenger train and a rotary snow plow; one employee killed and one injured.

dr, 12th, Pittsburgh & Lake Erie, Mahoningtown, Pa., passenger train No. 21 was derailed by a defective rail and five passenger cars were overturned. Twenty passengers were injured.

unx, 13th, Illinois Central, Pomeroy, Iowa, a passenger train was derailed and one passenger car overturned. Five passengers were injured.

bc, 14th, 3 a.m., Chicago, Rock Island & Pacific, Dwight, Kan., butting collision between westbound passenger train No. 3 and the eastbound "Golden State Limited," badly damaging both engines and parts of the baggage cars. The engineman of the eastbound train who, it is said, had disregarded a meeting order, was killed and an express messenger was injured.

bc, 14th, Southern Pacific, Sierra Blanca, Texas, butting collision between the westbound Sunset Limited express and an eastbound freight, wrecking both engines. One fireman and one tramp were killed.

xc, 14th, 6 a.m., Chesapeake & Ohio, Lynchburg, Va., collision between an empty engine and a freight train; four employees killed and three injured. There was a dense fog at the time.

unx, 14th, Cumberland Valley, Hagerstown, Md., a freight train was derailed and several cars were wrecked; one brakeman was killed and two other trainmen were injured.

15th, 1 a.m., Southern Railway, Camden, S. C., a passenger train was derailed at a switch and several passenger cars, together with two freight cars standing on a side track, were wrecked. One passenger was injured and a tramp was killed.

15th, Wabash road, Elm Point, Mo., a passenger train was derailed while running at high speed and five passenger cars were ditched. Nine passengers were injured.

rc, 16th, 5 a.m., International & Great Northern, Kyle, Texas, passenger train No. 7, standing at the station, was run into at the rear by passenger train No. 5 and one sleeping car was wrecked. The engineman, two other trainmen and several passengers were injured.

xc, 16th, Lehigh Valley, Geneva, N. Y., a freight train broke in two and the rear portion afterward ran into the forward one. A man stealing a ride was killed.

unf, 16th, Pennsylvania Lines, Remington, Ind., a freight train was derailed by a plank which had been maliciously placed on the track, and the engine was overturned. The engineman was killed and the fireman badly injured.

bc, 17th, Union Pacific, Brady Island, Neb., butting collision between a passenger train and a freight, during a dense fog. One engine was wrecked and three cars were badly damaged. A newsboy was killed and one trainman was injured.

xc, 17th, 2 a.m., Chicago, Indianapolis & Louisville, Cyclone, Ind., collision between a passenger train and a freight; one sleeping car overturned, 10 passengers injured. There was a dense fog at the time.

xc, 17th, Delaware, Lackawanna & Western, Washington, N. J., the engine of a freight train standing on a side track and fouling the main track was struck by the engine of a passenger train passing on the main line and the engines were badly damaged. One engineman was killed and the other fatally injured.

17th, Chicago, Rock Island & Pacific, Rockdale, Ill., an eastbound passenger train collided with a freight during a dense fog. The fireman was injured.

bc, 19th, Union Pacific, Wahsatch, Utah, butting collision between a freight train and a work train, both running at high speed, wrecking both engines and many cars. One brakeman and one fireman were killed and one employee was injured. It is said that the collision was due to a mistake in the train despatcher's office.

bc, 20th, Macon, Dublin & Savannah, Vidalia, Ga., butting collision between a passenger train and a switching engine, the latter being on the main track without authority. Three trainmen and six passengers were injured.

bc, 21st, Galveston, Harrisburg & San Antonio, Comstock, Texas, butting collision of freight trains, wrecking both engines and five cars. Four trainmen were injured.

21st, 2 a.m., Lake Shore & Michigan Southern, Ashtabula, Ohio, the westbound Twentieth Century Limited express train was derailed at a defective switch, three of the five cars running off. The train was running at low speed, having been unexpectedly stopped a short distance east of the point of derailment.

rc, 23d, Chicago, Burlington & Quincy, Knoxville, Iowa, a passenger train ran over a misplaced switch and collided with a freight train standing on a side track, badly damaging the engine. The engineman was killed and several passengers were injured.

bc, 23d, 1 a.m., Southern Railway, Roe Junction, Tenn., butting collision of freight trains, each train being drawn by two engines. One fireman was killed and three other trainmen were injured. It is said that the collision was due to the failure of the conductor and enginemen of one of the trains to examine the register at the last station which they had passed.

bc, 23d, Southern Railway, Elks, Ala., butting collision between passenger train No. 42 and freight train No. 63. One fireman was injured. There was a dense fog at the time.

23d, Northern Pacific, Weeksville, Mont., passenger train No. 3 was derailed and five cars were ditched. The passengers escaped with slight injuries.

unf, 23d, Southern Railway, Toccoa, Ga., passenger train No. 36 was derailed by a landslide and the engine and mail car were wrecked. The engineman, fireman and a man stealing a ride were killed.

25th, Wabash Road, Elm Point, Md., eastbound passenger train No. 4 was derailed and five passenger cars were badly damaged. Four passengers were injured.

bc, 26th, Atlantic City Road, Cedar Brook, N. J., collision of eastbound and westbound passenger trains, badly damaging both engines and wrecking a freight house. Three trainmen and one passenger were injured.

*†26th, 10 p.m., Southern Pacific, Lacoste, Texas, the eastbound Sunset Limited passenger train ran into the rear of a preceding passenger train, standing at the station, crushing a caboose at the rear of the standing train and almost completely wrecking a sleeping car next ahead of the caboose. A day car farther ahead was badly damaged and three passengers riding in it were killed. Six passengers and two trainmen were injured. The wreck took fire and all of the combustible portion of the cars and engines was burnt up. Reports state that the fire originated in the fuel oil in the tender.

*27th, Chicago, Burlington & Quincy, Thomson, Ill., a passenger train was derailed and one sleeping car and one chair car were ditched. The wreck took fire and was mostly burnt up. Five passengers were injured.

rc, 29th, Atchison, Topeka & Santa Fe, Strong City, Kan., eastbound passenger train No. 4 ran into the rear of a preceding freight train which was entering a side track. At the rear of the freight train, behind the caboose, was a carload of cattle. This and the caboose were wrecked. Four employees on the passenger train and five drovers in the caboose were injured.

unf, 29th, Southern Pacific, Surf, Cal., a freight train was derailed by a landslide and the engine and four cars were wrecked. The engineman was killed and two other trainmen were injured.

rc, 30th, Erie road, Ashland, Ohio, rear collision of freight trains, damaging two engines and six cars. Two firemen were killed and two other trainmen were injured. The second train had been admitted to the block section occupied by the first, in consequence of the error of the signalman.

bc, 30th, Pennsylvania road, near Reynoldsville, Pa., butting collision between passenger train No. 107 and an empty engine which had been started in some unaccountable way from the engine house at Reynoldsville. Both engines were wrecked and a passenger car was badly damaged. The engineman and fireman of the passenger train were killed.

unx, 30th, Erie road, Concord, Pa., an express train running at full speed on a descending grade was derailed at a curve and all of the cars of the train were overturned. Many passengers were injured, but, according to reports, only one of them seriously.

unx, 30th, Grand Trunk, Swartz Creek, Mich., eastbound passenger train No. 6 was derailed at a switch. The engineman and fireman were injured.

bc, 31st, New York, New Haven & Hartford, Waterbury, Conn., butting collision between a northbound passenger train and a southbound empty engine, wrecking both engines. The engineman of the empty engine and the fireman of the passenger train were killed and two passengers and four trainmen were injured. The empty engine was running on the time of the passenger train without authority. A local paper says: The blame for the unfortunate accident seems to rest entirely upon the shoulders of the dead engineer, Henry W. Chapman. He had made the run to this city early in the morning as a pusher for a regular freight from Bridgeport. He had his orders to run extra to Bridgeport, keeping clear of all trains. He had made the run many times of late. He registered himself as leaving Waterbury at 8:18. He signed the order to run extra to Bridgeport at 8.09. He must have known that the passenger train was due to leave Union City at 8:13. He was also aware that this train was due to leave Waterbury for the north at 8:23. One of the local railroad men, who has fired for Engineer Chapman, said last evening: "Harry had often made this run, taking the risk of making Union City before meeting the up train. He was one of the best engineers on the road, but he would do that trick. I told him that he would do it once too often, but I hardly thought that my words would come true."

dn, 31st, Baltimore & Ohio, Cleveland, Ohio, a switching engine ran into an open draw and fell into the Cuyahoga River. The engineman jumped off and was injured.

dn, 31st, Georgia Railroad, Redan, Ga., a passenger train was derailed at a misplaced switch and the engine was overturned. The engineman and one passenger were injured.

[1]Accidents in which injuries are few or slight and the money loss is apparently small, will as a rule be omitted from this list. The official accident record published by the Interstate Commerce Commission quarterly is regularly reprinted in the *Railroad Gazette*. The classification of the accidents in the present list is indicated by the use of the following

ABBREVIATIONS.

rc	Rear collisions.
bc	Butting collisions.
xc	Miscellaneous collisions.
dr	Derailments: defect of roadway.
eq	Derailments: defect of equipment.
dn	Derailments: negligence in operating.
unf	Derailments: unforeseen obstruction.
unx	Derailments: unexplained.
o	Miscellaneous accidents.

An asterisk at the beginning of a paragraph indicates a wreck wholly or partly destroyed by fire; a dagger indicates an accident causing the death of one or more passengers.

TECHNICAL.

Manufacturing and Business.

The Spiral Nut Lock Co. has changed its address from 102 Chambers street to 142 Liberty street, New York.

The Newton Machine Tool Co., Philadelphia, is building an extension to its shops and will require new machinery.

The Southern Construction Co., Orange, Texas, has

been incorporated with $200,000 capital, to build railroads and bridges.

Dodge & Day, modernizing engineers of Philadelphia, are installing a new shop management system in the works of the Link-Belt Engineering Co.

The Noiseless Compressor & Air-Brake Co., of New York, has been incorporated with $200,000 capital. Fred. White, 308 West 42nd street, New York, is an incorporator.

The New York & Boston Railway Sanding Machine Co. has been incorporated at Portland, Me., with $350,000 capital. J. C. Ward is named as President, and B. C. Ward, Treasurer.

The Walter A. Zelnicker Supply Co., St. Louis, Mo., reports large sales of the Pritchard pressed steel car replacer. This replacer, which rides the rail, is made of pressed steel and is very strong.

A fire occurred on April 15 in the works of Pawling & Harnischfeger, makers of cranes and hoists, Milwaukee, Wis., but contrary to newspaper reports, it was confined to one building and will in no way delay the firm in filling orders.

The American Car Seat Co., of Brooklyn, N. Y., announces that after April 28 the Western Electrical Supply Co., of St. Louis, Mo., acting agents, will no longer represent its interests, and that the western territory covered by them will be attended to by H. E. Ackerly, its direct representative. The company requests that all communications be sent direct to its main office, 18 Guernsey street, Brooklyn, N. Y.

The Plunger Elevator Co., of Worcester, Mass., report the following sales: Two passenger elevators with a travel of 103 ft. and one freight elevator with a travel of 114 ft. for the Victoria Hotel, New York; four elevators, car travel 114 ft., for the State Mutual Life Insurance Bldg., Worcester; six elevators with a travel of 125 ft. for the new building of the State Mutual Life Insurance Co., of Boston; and a car lift with a travel of 25 ft. and a capacity of 60,000 lbs. for the car barn of the Worcester Consolidated Street Railway Co.

The Stanley Electric Mfg. Company has sold the following apparatus to the New York Edison Co., supplementing the half million contract recently reported: One thousand k.w. S. K. C. generators and seven 150 k.w. Booster sets. Other recent sales are: Three 550 k.w. S. K. C. synchronous motors to the Municipal Gas Co., of Albany; thirty-two 38 h.p. and twenty 50 h.p. street railroad motors to the Sheboygan Light, Power & Railway Co., of Sheboygan, Wis., and a 750 k.w. engine type railroad generator to the Trenton Street Railway Co.

Iron and Steel.

The Wilson Foundry & Machine Works has been organized to make car wheels at Kanawha Falls, W. Va.

The Monongahela Steel Construction Co., 419 Market street, Camden, N. J., has been incorporated with $125,000 capital to make steel plates and structural material.

The Future of the Gas Engine.

At a recent meeting of the Canadian Society of Civil Engineers, Mr. H. M. Jaquays said: "In small units, at any rate, the internal combustion engine can, as far as cost is concerned, successfully compete with the steam engine; while the use of gas and oil engines for driving electric-lighting and pumping machinery, for automobiles and marine work has long passed the experimental stage. Perhaps under no conditions does the gas engine promise more than in connection with, and when run by the gas from, blast furnaces. So great has been its success already in this relation that one enthusiast has ventured to prophesy that 'the day is not far distant when iron will be a by-product of the blast furnace, and furnaces will be primarily gas producers, while steam engines will have to be sought for in museums.' It is probable that even the most ardent supporters of the internal-combustion engine do not look for this state of affairs in the immediate future. But when we realize that smelting one ton of iron supplies gas equal to 9,000,000 British thermal units, and that the gas is more than 3½ times as efficient when used in the gas engine as when used in steam-boiler furnaces, and when, moreover, we bear in mind the successes of the past decade, we cannot but expect from these engines much more in the near future than has been or is at present being accomplished."

Electric System For Shops.

In the present state of the art the 250-volt direct current system is better adapted for all around railroad shop purposes than the alternating current system. For use on cranes, on the transfer table, and on individual machine tools, the variable speed, direct current motor is best suited. The alternating current induction motor has the advantage of having no commutator or brushes, and will therefore, require less attention, but this advantage will not justify the extra first cost involved in its installation under existing commercial conditions, in a plant of this size. As a general rule all machines requiring over 3 or 4 h.p. should be equipped with a separate motor. Smaller machines can be arranged in groups each driven by line shafting operated by a motor of a uniform 10 h.p. size.—*Mr. George A. Damon before the Western Railway Club.*

Pedrick & Ayer's New Shop.

The Pedrick & Ayer Co. is forced by the growth of business to seek more commodious quarters, and has built new modern works adjoining the Clinton avenue station of the Central R. R. of New Jersey at Plainfield. The buildings are of brick and steel of slow-burning construction. The plant consists of a main shop 100 ft. x 400 ft., boiler house 40 ft. x 40 ft., engine house 40 ft. x 40 ft., blacksmith shop 40 ft. x 50 ft., pattern and storage shop 45 ft. x 100 ft.

The main building contains the offices, draughting room, tool room and storage for raw materials and finished parts. In the machine shop the main bay is provided with a 15-ton Shaw electric crane equipped with three motors. Besides the main traveling crane there are numerous hoists and jib cranes actuated by compressed air. The machine tools are all driven by electric motors, the prevailing plan being to group several machine tools on one countershaft, this in turn being belted to a motor of fair size and efficiency. In the testing department practical working conditions are provided for the air compressors. Portable and stationary riveters, hoists and cranes are produced in great variety and size. A spur from the railroad extends three car lengths under the crane, making rapid loading possible. The engine room contains a belted automatic air compressor made by the company and two direct-connected dynamo-engine sets for supplying power and light to the entire works. The sets are 150 kilowatts capacity each, the engines furnished by the Ames Iron Works and dynamos and switchboards by the General Electric Co.

Broken Joints on Illinois Central.

The Illinois Central will in future make broken joints standard, in laying 85-lb. rail. Up to the present, even joints have been used on all the lines, except on curves.

Signaling.

The Illinois Central line from Fulton, Ky., to Memphis, Tenn., which is now being double-tracked, is being equipped with Hall automatic electro-gas semaphore block signals.

THE SCRAP HEAP.

Notes.

The railroads centering in Peoria have agreed to charge storage on freight in freight houses beginning May 1. The rate will be 5 cents a ton a day after 48 hours.

Prominent traveling freight agents from different parts of the country are going to meet in Cincinnati June 5 and 6 with a view to organizing a national association of traveling freight agents.

Western papers report that the Southern Pacific has taken off the baggagemen from most of its trains on the Pacific system and will combine the duties of express messenger and baggageman in one person. It is also reported that train collectors, to relieve the conductor of the work of collecting tickets and fares, are now employed on the Southern Pacific.

The flour millers of Minneapolis, and also those of Chicago, have been running their mills too "strenuously" and have overstocked themselves with flour and forced down the price; and now they are again loudly publishing their old complaint that the railroads discriminate against them by carrying wheat to the Atlantic seaboard more cheaply than they carry flour.

In the United States District Court at Columbus, Ga., April 14, an injunction was granted restraining a number of railroad companies from making an increase of 2 cents per 100 lbs. in the rate for carrying lumber to western points. The petitioner was the Georgia Saw Mill Association. April 24 is the date set for the hearing on the application for the permanent injunction. The petitioner alleged that the railroads had made the increase by means of an illegal combination.

According to one of the railroad news editors of the daily press the stiffening of freight rates which has followed the strengthening of the Interstate Commerce law by the Elkins bill has produced such a chilly atmosphere in the offices of some of the great western industries which have employed high salaried traffic managers that the said traffic managers are losing their jobs. The necessity of making "deals" with the railroads having been removed, a hundred-dollar clerk is able to do the work which heretofore has required a high grade of "talent."

The wrecking train of the Wheeling & Lake Erie, stationed at Columbia, Ohio, has been fitted with a "telegraphone" (recently described in the *Railroad Gazette*) by which, with the aid of suitable apparatus in the telegraph offices, telephonic connection may be quickly made with the superintendent's office from any point along the line of the road where the car may happen to be stationed. The conducting wire is thrown over a wire of the telegraph line by means of a light pole extending upward from the car, and climbing a telegraph pole is unnecessary.

Traffic Note.

"Last year 19,753 orders for stewed California prunes and 7,000 for California figs were served on the dining cars of the New York Central."

This we quote from a daily paper, the reporter of which, no doubt, wormed the information out of the reluctant Daniels. The figures in the first item represent an increase over 1899 of 37,830 per cent., as appears from the following table.

CALIFORNIA STEWED PRUNES SERVED ON THE N. Y. C.

Year.	Orders.
1902	19,753
1901	9,753
1900	753
1899	53

And that is not the most startling thing about it, either; the 53 passengers who ordered California prunes in 1899 did not get them. They got only French prunes. During the same four years the stewed prune orders on the other railroads of the country have increased scarcely enough to mention, and the advertising agents have had to make use of pictures and society notes, and alleged prospective improvements in order to hold the attention of the public. Here are the figures:

PRUNES A LA CARTE, 4 YEARS' BUSINESS.

	N. Y. C., 3,320 miles.	All other roads, 196,680 miles.	Average per mile of road. N. Y. C.	Others.
1902	19,753	13	595	0.00006
1901	9,753	12	...	.....
1900	753	11	...	.....
1899	53	10	...	.....

Great Northern Steamships.

The first of the Great Northern steamships, the "Minnesota," was launched from the yard of the Eastern Shipbuilding Company, New London, Conn., on April 16. This vessel is not only the largest American built vessel, but she will be the largest dead-weight carrier afloat, exceeding in capacity—both weight and volume—the "Celtic," the "Cedric," and all the large German built vessels. Her gross tonnage will be about 21,000 tons, which is the same as the "Cedric," but her load displacement will be 3,000 tons greater, and the dead-weight capacity 7,000 tons greater than the White Star Liners. She is 630 ft. long, 73 ft. 6 in. beam, 55 ft. 6 in. deep, with a load displacement of about 40,000 tons, and is built of steel throughout, with five continuous steel decks and three partial decks, 10 cargo holds, and a double bottom 6 ft. deep. There are double hatches in each hold, centerline bulkhead, pipe chambers and emergency drain, inclined coal bunker bulkheads, and other interesting features. The engines are of the triple expansion type with cylinders 29 in., 51 in. and 89 in. diameter respectively, and a stroke of 57 in. The boilers are of the water-tube Niclausse type. There are 16 of these, working at 250 lbs. pressure with induced draft, and divided into four main batteries. These boilers have a collective grate surface of 1,080 sq. ft. and an aggregate heating surface of 41,000 sq. ft. The electric plant is extensive, and all the auxiliaries outside of the main propelling engines are electrically operated. The "Minnesota" and her sister ship were designed by Mr. William A. Fairburn, Naval Architect and Engineer of the Eastern Shipbuilding Company.

British Railroad Building in Africa.

In England, the praiseworthy habit of asking pertinent questions is not confined to British stockholders. One of the things to be considered by the House of Lords, when it meets on April 27 is the result of inquiries, summarized by London *Transport*, the ablest railroad journal in Europe, as follows: The government will be asked: (1) Whether the railroads, estimated to cost £5,000,000, which Lord Milner has announced are about to be built in the Transvaal and Orange River colony, will be built on the departmental system, that is, by government officials, without the intervention of either contractor or company; (2) whether Messrs. Pauling & Co., Limited, offered on April 8, 1895, to construct and equip the railroad from Mombasa to Uganda, 3 ft. 6 in. gage, in four years, for £2,240,000 cash, namely, £3,400 per mile, for a distance of 657 miles; (3) whether this offer was refused by His Majesty's government owing to their belief that the departmental system would enable them to save a large proportion of the contractors' profit; (4) whether the refusal by His Majesty's government of Messrs. Paulings' offer, and the decision to construct the Uganda railroad by methods "most likely to insure the prompt construction of the line" and "in the least onerous and the least hazardous manner," had cost the nation over £3,000,000 in excess of Messrs. Paulings' tender, and extended the time of construction from four years to eight; (5) whether the West African railroad had also been built on the departmental system, and if it has taken 3½ years to build 40 miles at a cost of about £15,000 per mile; (6) whether it is true that Messrs. Pauling offered in June, 1901, to build the extension of this railroad from Tarkwa to Kumassi, 140 miles, for a sum of £6,680 per mile complete, including survey and rolling stock, and to have the line sufficiently finished to convey traffic to Obuassi by May, 1902, and to Kumassi by the end of March, 1903; (7) whether this offer was refused, and how much the railroad has cost, and how far it is advanced.

Easy Money for a Brotherhood.

An Erie locomotive engineer complained that his increase of pay began March 10, instead of March 1, as agreed. M. H. Shay, chairman of the board of adjustment of the Brotherhood of Locomotive Engineers of the Erie Railroad, explains as follows: "Mr. Willard agreed in February that whatever increases were made should take effect March 1. At the conference in which the increases were agreed upon, and in which there was nothing but harmony, Mr. Willard said the advance in wages would cost the road $15,000 a month. We then asked him to give us $5,000 and postpone the date of the increase until March 10. Mr. Willard did so reluctantly, at our request, saying he expected he would be criticized for the delay. We assured him that we assumed the responsibility. Mr. Willard is in no wise to blame. That $5,000 went to pay the expense of the meetings of the Board of Adjustment, and the members of the Brotherhood are satisfied."

Measuring Yard Work and Minor Subjects.

At the March meeting of the Iowa Railway Club there was a paper by Mr. Copley, of the Rock Island, on the

best method of counting cars to measure the work done in a large yard, and there was a brief discussion on flat wheels. Mr. Copley spoke of the causes of excessive cost in yard work, such as having to deliver cars too frequently to industries and the use of small switching engines. Many roads have increased their road power 50 per cent. while leaving the yard engines the same as they were 15 years ago. The proper way to measure the work done is to count (1) cars received and forwarded in trains; (2) received from and forwarded to connecting lines; (3) cars moved by switch engine for a switching charge. In some yards it will be found that engines go out five miles to get cars and yet receive no credit for the work done.

In the discussion, Mr. Wagner and Mr. Welsh were the principal speakers. It was pointed out that sometimes the records of a yard were made unduly favorable by counting whole trains on which the only yard work done was to take off one caboose and put on another. Some of the speakers thought that the cost of damage to cars and certain other items should not be considered in calculating the cost per car handled. The upshot of the whole discussion appears to have been that there are few if any yards that can be compared with any other yard, in the matter of economy, except by making allowance for a great many conditions which are not uniform.

The discussion on wheels consisted mostly of views as to the effect of water on the rails. Leaky injectors and leaky tenders were believed to be very prolific causes of sliding. A cylinder cock which leaks against the truck wheel and keeps the wheel wet, wets the rail, and this is always liable to cause sliding, especially in cold weather. If the heating pipes of passenger cars are blown out approaching a station the escaping water is liable to wet the rails just enough to greatly interfere with the proper action of the brakes.

Mr. Gould asked for information as to the efficiency of the air signal on passenger trains. He had found that the swinging of the car would sometimes blow the whistle, and also that in very cold weather the freezing of the hose, combined with the motion of the cars, would sound the whistle so as to confuse the engineman.

Disastrous Collision at Red House, N. Y.

In a collision on the Erie road at Red House, N. Y., seven miles west of Salamanca, on the morning of April 20, about 3 o'clock, one employee, one mail clerk and four or more passengers were killed and five trainmen and about the same number of passengers were injured. The wreck took fire and the bodies of most of the dead were burned beyond recognition. Five passenger cars and several freight cars were consumed. The railroad at this point is single-track. At Red House, which is on a long tangent, there is a passing track about a mile long, with a block signal cabin at or near the center. The collision was between eastbound passenger train No. 4 and a westbound freight. Just as the freight train entered the side track, some slight delay occurred and the leading one of the two engines was cut off and run forward on the side track to carry a flagman to stop No. 4. There was considerable fog at the time and the flagman failed to signal the passenger train, or at any rate failed to get his signal recognized; and the block signal operator, assuming, when he saw the headlight of the empty engine, that the freight was wholly clear of the main line, gave a clear block signal to the passenger train; the passenger, therefore, proceeded at full speed and struck the freight at the intersection of the main and side tracks, at the east end. The second engine of the freight and half a dozen coal cars were wrecked, and the engine, combination car, two coaches and three sleepers of the passenger train were badly damaged. As before stated, the combustible portion of the wreck took fire and was destroyed. The block signal operator is about 19 years old. He has worked at Red House about six months and the length of his service for the company before this was about 15 months.

New Office Building For Chicago Railroads.

The contract for a building to be known as the Railway Exchange, which will stand at the corner of Michigan and Jackson boulevards, Chicago, has been let to T. Nicholson & Sons Co., work to begin May 1. Mention of this building, which is to be built by the Standard Office Company, was made in our issue of Nov. 14, 1902, page 877. It will be 17 stories high and will cost about $2,000,000. The general offices of the Atchison, Topeka & Santa Fe, the Chicago, Milwaukee & St. Paul, and the Chicago & Alton are to be in the building, and the names of Presidents Ripley, of the Santa Fe, and Earling, of the St. Paul, appear in the Board of Directors.

The Pennsylvania Tunnel at Washington.

It is understood that specifications will be sent out and bids asked within a month for the construction of the tunnel under Capitol Hill in connection with the track elevation and new Union station at Washington. Plans for this part of the work are being prepared by the Chief Engineer of the Pennsylvania R. R., and work will probably be commenced within 60 days at a point near Garfield Park, southeast. (April 17, p. 288.)

MEETINGS AND ANNOUNCEMENTS.

(For dates of conventions and regular meetings of railroad associations and engineering societies see advertising page xvi.)

American Institute of Electric Engineers.

The subject for discussion at the meeting on April 24 will be Tendencies of Central Station Development. The programme follows: Introduction, President Scott; Economical and Safe Limits in Size of Central Stations, by H. A. Lardner; Safety Devices in Central Stations and Sub-stations, by Phillip Torchio; Multiple versus Independent Operation of Units and Central Stations, by Peter Junkersfeld. Preceding the meeting there will be an informal dinner at Mouquin's, 454 Sixth avenue, near the 28th street station of the Sixth Avenue Elevated.

Railroad Boiler-Makers' Association.

The first annual convention of the International Railway Master Boiler-Makers' Association at Columbus, Ohio, on May 19, 20 and 21, has the following appetizing bill of fare:

1. Causes of fire-boxes cracking; why do they crack vertically instead of horizontally? Prevention of same. M. W. McCoy, Chairman.
2. Best method of setting locomotive flues; best tools for setting same; best method of caring for same while in service. C. F. Wilde, Chairman.
3. Best method of staying boilers and detecting defective stays. John Corbett, Chairman.
4. Best method of riveting seams in fire-boxes. H. Denzler, Chairman.
5. Best style of draft sheets and spark arrester. W. M. Evans, Chairman.
6. Best method of welding flues; best fuel for same. Frank Rahrle, Chairman.
7. Construction of boiler; kind, size and tools to use. W. A. Timms, Chairman.
8. Maintenance of boilers and roundhouse work. R. C. Young, Chairman.
9. Best method of applying patches on fire-boxes. J. J. Meyer, Chairman.
10. Best method of washing boilers. Floyd Harris, Chairman.
11. Cause of mud rings leaking and the best method of preventing same. P. Sullivan, Chairman.
12. Best method of taking out fire-boxes. J. A. Doarnberger, Chairman.

The officers of this Association are: President, F. J. Graves, Huntington, W. Va.; First Vice-President, J. A. Doarnberger, Roanoke, Va.; Second Vice-President, Wm. H. Laughridge, Columbus, Ohio; Chairman Executive Committee, Wm. P. Kelly, Dennison, Ohio; Secretary and Treasurer, P. Sullivan, St. Louis, Mo.; Assistant Secretary and Treasurer, E. C. Cook, St. Louis, Mo.

Master Mechanics' and Master Car Builders' Conventions.

The Executive Committee of the Railway Supply Men, J. Alexander Brown, Secretary, 24 Park Place, New York, has issued a circular giving information about railroad transportation to the Mackinac conventions in June. The New York Central offers a special train from New York, direct to Mackinac, provided there are 150 or more delegates, the train to leave New York June 15, at 1 p.m. It would leave Buffalo over the Michigan Central at 11:50 p.m., and arrive at Mackinac Island June 16, at 5 p.m. Applications for sleeping car accommodations should be made early to M. C. Roach, 1216 Broadway, New York. Delegates from eastern points may connect with this train by leaving Boston 10:45 a.m., June 15, by the Boston & Albany R. R. If there are sufficient passengers sleeping cars from Boston to Mackinac may be furnished. Applications should be made to A. S. Hanson, Boston.

From Philadelphia, Baltimore and Washington start Monday morning, June 15, and connect with this train at Buffalo, where sleeping cars may be attached, provided applications for accommodations are made early to W. H. Underwood, Michigan Central R. R., 299 Main street, Buffalo. From Cincinnati, Pittsburg and Cleveland start Monday evening, making connections at Detroit with 8:30 a.m. train, arriving Mackinaw City at 7:45 p.m. unless the number is sufficient to warrant special trains from Detroit, in which event better service may be given. Applications for parlor car accommodations should be made to J. S. Hall, Michigan Central R. R., Detroit. From Chicago, St. Louis, Kansas City and Omaha apply to L. D. Heusner, Michigan Central R. R., 119 Adams street, Chicago.

Return fare at one-third rates, provided that certificates are obtained when purchasing tickets and that the certificates are properly vised at Mackinac Island, before leaving, by J. Alexander Brown, and also by the Special Railroad Agent in attendance. These return tickets will not be good on steamer lines. The circular gives the fares by the Manitou Steamship Co., the Northern Steamship Co., the Detroit & Cleveland Navigation Co., and the Cleveland & Buffalo Transit Co. The Grand Hotel, Mackinac Island, has been chosen as the headquarters for both conventions. For hotel accommodations address the Grand Hotel, Mackinac Island, Mich., or Henry Weaver, care of Planters Hotel, St. Louis, Mo. Members of the Railway Supply Fraternity will obtain the same rates for hotel accommodations as are given members of the Associations.

PERSONAL.

—Mr. Beverly R. Keim, formerly and for many years General Passenger Agent of the Kansas Pacific, died recently at Philadelphia.

—Mr. Carlos French, a Director of the New York, New Haven & Hartford, died April 15, at his home in Seymour, Conn., aged 70 years.

—Mr. W. H. Winfield, of Texarkana, Texas, at one time General Passenger Agent of the St. Louis Southwestern, died recently, aged 54 years.

—Mr. C. C. Schneider, Vice-President of the American Bridge Company, in charge of engineering, has resigned; but at the request of the management he will remain with the company in a consulting capacity.

—Dr. M. Gardner, Superintendent of the Hospital Department of the Southern Pacific Company, died at San Francisco, Cal., April 18, following an operation for appendicitis.

—Mr. J. I. Riegel, C. E., heretofore Division Engineer of the Delaware, Lackawanna & Western, at Scranton, Pa., has become Consulting Engineer of the Dunning Engineering Company, of Scranton.

—Col. William R. Arthur, President of the Illinois Central from 1858 to 1865, and a well-known railroad man, died at his farm near Urbana, Ill., April 20, aged 82 years. Col. Arthur was born at Hillsborough, Ohio, and was an engineer of considerable ability. He was at one time Commissioner for the railroads south of the Ohio River.

—Mr. Walter S. Gurnee died at his home in New York city April 17, at the age of 91 years. In the early fifties Mr. Gurnee was a prominent business man in the west. In 1863 he came east and was for many years a broker. He was Vice-President and a Director of the Missouri River Power Company and a Director in several other companies.

—Mr. George Whale, Superintendent of the locomotive running department of the London & North-Western, has been chosen by the Directors of that company to take the place of Chief Mechanical Engineer on the retirement of Mr. F. W. Webb next July. Mr. Whale has been with the company many years, having served his apprenticeship under Mr. McConnell. He is spoken of as a man exceedingly popular with all ranks of the service.

London *Transport* says: "Mr. Whale has had a long and distinguished connection with the engineering department of the London & North-Western, and has held the position of Superintendent of the running department throughout the system for the last four or five years. He was educated at the Lewisham Grammar School. After remaining for some years in the workshops, he took a turn upon the footplate in order to gain experience. He then entered the drawing office of the company at Wolverhampton, and was subsequently transferred to the drawing office at Crewe. A few years later he was promoted to the position of chief assistant of the running department in the Northern Division under the late Mr. John Rigg, and in 1877 succeeded to the post of his late chief."

—Mr. J. L. Mohun, who leaves the service of the Pennsylvania Railroad to go to the Western Steel Car & Foundry Company as Mechanical Engineer, began his railroad service with the former company as special apprentice at their Altoona shops in 1890. In 1897 he was made inspector on the Pennsylvania Railroad Division, and three years later Master Mechanic at Lambertville. In August, 1900, he was promoted to the position of Assistant Engineer of Motive Power of the United Railroads of New Jersey Division, which position he has held until now.

—Mr. Stewart L. Moore, General Freight Agent of the Northern Pacific, died suddenly April 21, at his home in St. Paul, Minn. Mr. Moore was born at Erie, Pa., in 1853, and has been a well-known railroad man for many years. In 1878 he was a clerk in the office of the Northwestern Pool Association, which included the Chicago, Milwaukee & St. Paul, the Chicago & North Western, and the Chicago, Rock Island & Pacific. He was later a clerk in the general freight office of the Northern Pacific. In 1884 he became Assistant General Freight Agent and since 1887 had been General Freight Agent.

—Mr. John Doyle, Superintendent of Tracks of the Pere Marquette, has resigned and will engage in contracting business with the firm of John C. Carland, Toledo. Mr. Doyle was for 22 years Superintendent of Tracks, Bridges and Buildings of the Detroit & Bay City, the Detroit, Lansing & Northern and the Chicago & West Michigan. Before that he was fireman and engineman on the Michigan Central. He is President of the Roadmasters' Association, which office he also held in 1890 and in 1891. He is also a member of the American Railway Engineering and Maintenance of Way Association.

—Mr. W. P. Whitten, the new Resident Engineer of the Great Northern at St. Paul, was born in Newton, Mass., in 1860. After taking a special course in mathematics he took a position with the Pennsylvania Railroad Company at Philadelphia. In 1885 he went to Sioux City, Iowa, and the next year was made city engineer. From 1887 to 1892 he was engaged on important municipal work. In 1892 he was Assistant City Engineer at Grand Forks, N. Dak., and the following year went to the Great Northern as Assistant to the Engineer of Bridges. In 1895 he was appointed Assistant Engineer and for the past three years he has been Engineer of Terminals at St. Paul and Minneapolis, under the title of Assistant Engineer.

ELECTIONS AND APPOINTMENTS.

Atchison, Topeka & Santa Fe.—Charles Russell, heretofore Division Superintendent of the Northern Pacific, has been appointed Superintendent of the Illinois Division of the A., T. & S. Fe, and R. J. Parker has been appointed Superintendent of the Missouri Division.

Baltimore & Ohio.—C. W. Galloway, heretofore Division Superintendent at Cumberland, has been appointed Superintendent of the Baltimore Division at Baltimore, Md., succeeding J. E. Spurrier, who in turn succeeds T. C. Prince as Superintendent of the Shenandoah Di-

vision at Winchester, Va. F. A. Husted has been transferred from the Monongah Division to the Cumberland Division, to succeed Mr. Galloway. F. E. Blaser, Division Superintendent at Parkersburg, W. Va., has been appointed to succeed U. B. Williams as Division Superintendent at Wheeling, W. Va. Mr. Williams succeeds Mr. Husted at Grafton, W. Va. C. E. Bryan, heretofore Division Engineer of Maintenance of Way at Parkersburg, succeeds Mr. Blaser as Superintendent of the Ohio River Division. H. P. Knight, formerly with the Baldwin Locomotive Works, has been appointed Master Mechanic, with headquarters at Castle Junction, Pa., succeeding H. B. Brown.

Brunswick & Birmingham.—E. C. Machen has been elected President, succeeding C. L. Hyde.

Canadian Freight Association.—The officers of this Association are: President, W. P. Hinton; Vice-Presidents, Carl Howe and W. R. MacInnes; Secretary and Treasurer, John Earls.

Canadian Pacific.—J. W. Leonard, heretofore General Superintendent, has been appointed Assistant General Manager of the lines West of Lake Superior, with office at Winnipeg.

J. S. Brownlee, heretofore Locomotive Foreman at Moose Jaw, has been appointed Acting Superintendent, with headquarters at Brandon, Man., succeeding Superintendent J. G. Taylor.

Chicago, Rock Island & Pacific.—S. F. Forbes has been appointed Purchasing Agent, with headquarters at Chicago, Ill., succeeding F. A. Marsh, resigned. H. C. Pearce succeeds Mr. Forbes as Assistant Purchasing Agent.

J. B. Smalley has been appointed Division Superintendent, with headquarters at Des Moines, Iowa, succeeding W. J. Lawrence, who has been transferred to succeed Mr. Smalley as Division Superintendent at Esterville, Iowa.

Chicago, Rock Island & Texas.—At a meeting held recently A. E. Mitchell was elected Secretary and Treasurer.

Erie.—Galan B. Owen has been appointed Assistant to the General Manager. W. R. Collins has been appointed Assistant Purchasing Agent.

J. M. Davis, Division Superintendent, with headquarters at Hornellsville, N. Y., has resigned.

Great Northern.—R. C. Morgan has been appointed Superintendent of the Spokane Falls & Northern, the Columbia & Red Mountain, the Nelson & Fort Sheppard, the Red Mountain, the Washington & Great Northern, and the Vancouver, Victoria & Eastern Ry. & Navigation Company, with headquarters at Spokane, succeeding F. S. Forest, transferred.

D. M. Philbin has been appointed Assistant General Superintendent, in charge of the Eastern Division, with headquarters at West Superior, Wis., and will report to the General Superintendent. F. S. Elliott has been appointed Assistant Superintendent of the Cascade Division, with headquarters at Everett, Wash., succeeding Mr. Morgan.

International & Great Northern.—C. R. Evans has been appointed Superintendent of Dining Car Service.

Lake Shore & Michigan Southern.—D. T. Murray, heretofore Division Superintendent at Youngstown, Ohio, has been appointed Assistant General Superintendent (a new position), with headquarters at Cleveland, Ohio.

Maine Central.—F. E. Sanborn has been appointed Assistant Superintendent of the Portland Division, with headquarters at Portland, Me.

Minneapolis, St. Paul & Sault Ste. Marie.—E. T. Stone has been appointed Purchasing Agent, with headquarters at Minneapolis, Minn., succeeding H. C. Pearce, resigned.

Missouri Pacific.—Russell Harding, Third Vice-President and General Manager, office at St. Louis, has charge of operation; C. G. Warner, Second Vice-President, St. Louis, has charge of finances and accounts, and A. C. Bird, Vice-President, will have charge of traffic, with office at Chicago.

Morgantown & Kingwood.—P. Hayden has been appointed Master Mechanic, with headquarters at Morgantown, W. Va.

New York Central & Hudson River.—E. V. W. Rossiter has been elected a Director, succeeding the late S. D. Babcock.

Northern Pacific.—M. C. Kimberly has been appointed Assistant General Manager. F. W. Gilbert, Division Superintendent at Spokane, becomes General Superintendent, succeeding Mr. Kimberly. E. J. Pearson, Assistant General Superintendent, has been transferred to Livingston, Mont., in charge of the Middle District; N. Kline has been appointed Assistant General Superintendent of the Eastern District, headquarters at St. Paul. W. C. Albee becomes Superintendent of the Pacific Division at Tacoma, succeeding Mr. Kline, and B. E. Palmer becomes Superintendent of the Rocky Mountain Division, with headquarters at Missoula, Mont., succeeding C. Russell, resigned. I. B. Richards becomes Superintendent of Car Service. (See Atchison, Topeka & Santa Fe.)

Pennsylvania.—H. H. Maxfield has been appointed Assistant Engineer of Motive Power, with headquarters at Jersey City, N. J., succeeding John L. Mohun, resigned, effective April 15.

Pere Marquette.—J. K. V. Agnew, Superintendent, and John Doyle, Superintendent of Tracks, have resigned.

Pittsburgh, Shawmut & Northern.—C. J. Renwick has been appointed General Freight and Passenger Agent, with headquarters at St. Marys, Pa., succeeding C. H. Hammond.

Queen Anne's.—G. H. Haynes has been appointed General Freight Agent and J. C. Bosley General Passenger Agent.

Velasco, Brazos & Northern.—W. C. McLelland has been appointed General Superintendent, with headquarters at Velasco, Texas.

LOCOMOTIVE BUILDING.

The Boston & Albany is having 12 locomotives built at the Schenectady Works of the American Locomotive Co.

The Santa Fe, Prescott & Phoenix is having three locomotives built at the Brooks Works of the American Locomotive Co.

The Hicks Locomotive & Car Works has received an order from the United States Leather Co. for one four-wheel switching engine.

The Mill Valley & Mount Tamalpais Scenic R. R. has ordered from the Lima Locomotive & Machine Co., of Lima, Ohio, one 30-ton Shay geared locomotive for July delivery. The locomotive will have eight 30-in. drivers and three 10 in. x 10 in. cylinders. It will be used for operating excursion trains up and down Mount Tamalpais near San Francisco.

The Atchison, Topeka & Santa Fe intends to build in the near future 10 simple six-wheel switching locomotives at its Topeka shops. The locomotives will weigh 140,000 lbs., and have 20 x 26 in. cylinders, 51 in. drivers, extended wagon top boilers, with a working steam pressure of 180 lbs.; heating surface, 1,928 sq. ft.; 281 iron tubes, 2 in. in diameter and 12 ft. long; fire-box, 8 ft. 6 in. long and 41¼ in. wide; grate area, 29.25 sq. ft.; tank capacity, 4,000 gallons of water and eight tons of coal. The special equipment includes: American Brake Co.'s air-brakes, Ross-Mehan brake-shoes, Tower couplers, A., T. & S. F. standard headlights, and Simplex injectors.

The Pittsburgh & Lake Erie, as reported in our issue of March 17, is having five simple locomotives of the Atlantic type, built at the Schenectady Works of the American Locomotive Co., for June, 1903, delivery. The locomotives will weigh 167,000 lbs., with 97,000 lbs. on drivers. Diameter of cylinders, 20 in.; diameter of drivers, 72 in.; wide fire-box; heating surface, 2,800 sq. ft.; working steam pressure, 200 lbs.; tank capacity, 7,000 gal. of water and 10 tons of coal. The special equipment includes Westinghouse air-brakes, steel axles, Magnesia boiler lagging, Gould couplers, Monitor injectors, Dressel headlights, Paxton-Mitchell piston rod and valve rod packings, Coale safety valves, Economy sanding devices, and Nathan sight feed lubricators.

The San Pedro, Los Angeles & Salt Lake, as reported in our issue of April 10, is having four simple locomotives of the Northwestern type built by the American Locomotive Co. for August, 1903, delivery. The locomotives will weigh 157,000 lbs., with 90,000 lbs. on drivers. Diameter of cylinders, 19 in.; diameter of drivers, 70 in.; straight top type of boiler, with a working steam pressure of 2,000 lbs.; 326 tubes, 2 in. in diameter; fire-box, 92⅛ in. long and 65¼ in. wide; tank capacity, 5,500 gal. of water; oil capacity, 1,750 gal. The special equipment includes Westinghouse-American brakes, hammered steel axles, Magnesia boiler lagging, National hollow brake-beams, Pyle National electric headlights, No. 10 Ohio injectors, Ajax journal bearings, Sullivan piston rod and valve rod packings, Coale safety valve, Leach sanding devices, Michigan triple sight feed lubricators, Railway Steel Spring Company springs, Crosby steam gages and Leeds & Curtis swing head couplers.

The Newburg & South Shore has ordered one six-wheel simple switching locomotive from the Baldwin Locomotive Works. The locomotive will weigh 120,000 lbs., and have 20 x 26 in. cylinders, 52 in. drivers, wagon top boilers, with a working steam pressure of 180 lbs.; heating surface, 1,710.3 sq. ft.; 270 Shelby charcoal iron tubes, 2 in. in diameter and 10 ft. 11¾ in. long; open hearth fire-box, 9 ft. long and 3 ft. wide; grate area, 22.7 sq. ft.; tank capacity, 3,500 gallons of water and six tons of coal. The special equipment includes: Westinghouse-American air-brakes, Baldwin brake-beams and sanding devices, American brake-shoes, Buckeye couplers, Adams & Westlake headlights, Monitor injectors, American metallic piston and valve rod packings, Crosby safety valves and steam gages, Detroit sight-feed lubricators, Pittsburg Spring & Steel Co.'s springs, and Latrobe driving wheel tires. Metal cab. Orders will soon be placed for seven additional locomotives, four of which will be about 10 tons heavier on the drivers.

CAR BUILDING.

The Lexington & Eastern is reported in the market for 100 box cars.

The American Car & Foundry Co. has miscellaneous orders for 34 cars.

The Lake Shore & Michigan Southern is having three coaches built by Harlan & Hollingsworth.

The Tacoma Eastern is having 50 freights built at the Huntington Works of the American Car & Foundry Co.

The Chicago, Indianapolis & Louisville has ordered one cafe and one chair car from the American Car & Foundry Co.

The Norfolk & Southern is having 100 freights built at the Huntington Works of the American Car & Foundry Co.

The Chicago, Milwaukee & St. Paul is planning to build 300 drop-bottom gondolas at its own shops. These cars are to be of 100,000 lbs. capacity.

The Lehigh Valley Coal Co. has ordered 205 mine cars from the American Car & Foundry Co., in addition to the 100 reported in our issue of April 17.

The Kansas City, Mexico & Orient has ordered two first-class and two second-class coaches, two combination baggage and mail, and two combination baggage and express cars from the American Car & Foundry Co.

The Atchison, Topeka & Santa Fe is building 15 way cars at its Topeka shops, for April delivery. The cars will weigh 30,000 lbs. The special equipment includes: Westinghouse air-brakes and M. C. B. brasses, axles, brake-shoes, couplers and journal boxes.

The Wallace Shows Co. has ordered three 60-ft. flat cars, one 60-ft. special box car and one 60-ft. stock car of 60,000 lbs. capacity from Barney & Smith. These cars will be mounted on Barney & Smith standard circus-car patent swing motion trucks, with elliptic bolster springs.

The Hicks Locomotive & Car Works has orders to build one parlor car and one combination car for the Denver, Enid & Gulf; 30 flat cars for the Pearl & Leaf River; 10 flat cars for the Union Traction Co., Indiana; one 65-ft. flat car for the Donaldson Lithograph Co.; one 60-ft. flat car for Gollman Bros. circus; miscellaneous freight cars for the American Conduit Co. and the Deepwater R. R. and Coal Belt R. R.

BRIDGE BUILDING.

ASTORIA, ORE.—The County Commissioners will receive bids until May 5 for a drawbridge over Lewis and Clarke River.

AUBURN, IND.—The Board of Commissioners of De Kalb County will receive bids until 10 a.m., May 14, for the substructure and superstructure of nine small steel bridges and five concrete culverts.

BESSEMER, ALA.—The Birmingham Railway, Light & Power Co. is said to be planning a viaduct over the railroad tracks for the new electric line which will connect this city with Birmingham.

BIRMINGHAM, ALA.—The Jefferson County Board of Revenue has decided to ask for bids for a steel bridge over Warrior River at Atwood's ferry, to cost about $10,000.

CARROLLTON, MO.—Silas Ballard, Bridge Commissioner, will receive bids until 2 p.m., May 5, for four township bridges.

CHICAGO, ILL.—According to newspaper report the drainage board has decided to build new bridges of the bascule type at Dearborn and 22nd streets to cost $200,000 each.

COLUMBIA, KY.—The Fiscal Court of Adair County has appropriated money for an iron bridge over Russell's Creek.

CORNING, N. Y.—Bids will be received at the office of the Mayor until 10 a.m., May 4, for four steel spans, 149 ft. each, for the bridge over the Chemung River, and extensive repairs to the substructure of the Gibson highway bridge.

DANBURY, N. C.—I. M. Gordon, Chairman Board of County Commissioners, will receive bids until May 1 for three steel bridges.

DANVILLE, VA.—H. A. Cobb, of the American Tobacco Co., is said to be receiving bids for an 80-ft. iron and cement bridge to be built here by the company.

GETTYSBURG, PA.—The Gettysburg National Park Commission will receive bids on June 1 for a steel bridge over the Western Maryland R. R. at Reynolds avenue.

GREENSBURG, KY.—Woodson Lewis & Bro. are said to want bids until May 1 for a bridge over Green River.

HAZLETON, IND.—It has been voted to build a $40,000 bridge over White River.

IOWA CITY, IOWA.—The City Engineer is preparing an estimate for a new bridge on Iowa avenue over Ralston Creek.

LILLINGTON, N. C.—It is said that the County Commissioners will receive bids until May 4 for a $10,000 steel bridge at Aversasboro ferry.

MILWAUKEE, WIS.—According to report, the Board of Public Works will receive bids until May 19 for the West Water street bridge.

MONTGOMERY, ALA.—The City Council has directed the City Engineer to submit plans for a viaduct over the railroad culvert to connect Montgomery with West End.

NILES, OHIO.—The Osborn Engineering Co., of Cleveland, Ohio, is preparing plans for a bridge to be built by the Commissioners of Trumbull County.

OTTUMWA, IOWA.—The County Supervisors are considering a $17,000 bridge over the Des Moines River near Cliffland.

RICHMOND, VA.—The Chamber of Commerce favors a new bridge between this city and Manchester, to take the place of the toll bridge at the foot of 14th street.

ROCKVILLE, IND.—The County Commissioners will receive bids until noon May 5, for four bridges measuring 20, 26, 75 and 80 ft.

SCHENECTADY, N. Y.—The Schenectady Railway Co., according to local press reports, has petitioned the Board of Supervisors for permission to build a $200,000 bridge over Mohawk River.

SIOUX CITY, IOWA.—The City Council is planning to spend about $30,000 on new bridges.

STEELE CITY, NEB.—W. S. Dillon, County Clerk, Fairbury, Neb., will receive bids until noon, April 27, for a steel bridge over the Little Blue River.

TACOMA, WASH.—R. W. Clark, Commissioner of Public Works, will receive bids until 11 a.m., April 28, for a 250-ft. iron or steel bridge to be built over the gulch near the city reservoir.

TOPEKA, KAN.—It is reported that the County Commissioners will build a 92-ft. steel bridge over Mission Creek.

TORONTO, ONT.—The York Township Council has been petitioned to spend $20,000 for a new bridge over the Second Rosedale ravine.

WAVERLY, TENN.—A tax of $15,000 has been levied for a bridge over Duck River at Forsee's ferry.

WHEELING, W. VA.—Bids are being received for a steel bridge over Wheeling Creek, for which plans were prepared by the Osborn Engineering Co., of Cleveland, Ohio.

WOONSOCKET, R. I.—The finance committee of the City Council recommends an appropriation of $36,300 for rebuilding the Globe bridge.

YOUNGSTOWN, OHIO.—The County Commissioners have decided to build a viaduct on Mahoning avenue from Glenwood avenue to Powers Hill. Forty thousand dollars of the expense may be met by street railroad companies.

Other Structures.

BEAUMONT, TEXAS.—The Texas & New Orleans Ry. Co. is said to be planning an $80,000 passenger station.

BETHLEHEM, PA.—It is reported that the United States Ship Building Co. will spend $1,500,000 in enlarging the Bethlehem steel plant.

MEDFORD, MASS.—The Boston Steel & Iron Co., according to report, will build a new bridge and structural shop.

PARKERSBURG, W. VA.—It is said that the Parkersburg Iron & Steel Co. is planning extensive improvements to its plant.

PHILADELPHIA, PA.—The Philadelphia Steel & Iron Co., which recently absorbed the Ferro-Carbon Casting Co., at Frankford, Philadelphia, will build an extension to its shops to handle the increased business.

The Atlantic Works is getting plans ready for a new building at 22nd street and Gray's Ferry Road. It is to be of stone, 58 ft. x 200 ft., and will be ready for use within 11 months.

PROVIDENCE, R. I.—We learn from the Builders' Iron

Foundry that contrary to newspaper reports the company does not expect to build a new foundry in the near future.

ST. LOUIS, MO.—The National Iron Works, it is said, will enlarge its plant and spend $25,000 on new buildings.

SHREVEPORT, LA.—The machine shops and roundhouse of the Shreveport & Red River Valley R. R. are reported to have been destroyed by fire, together with several locomotives and cars.

SYRACUSE, N. Y.—The Solvay Process Co. will build a new roundhouse and turn-table.

RAILROAD CONSTRUCTION.

New Incorporations, Surveys, Etc.

ALASKA R. R.—This company has been incorporated in New Jersey to build a railroad from Valdez on Prince William Sound, Alaska, to Eagle City, on the Yukon River, a distance of 425 miles; also a branch from the head waters of the Tenana River northwest across the Yukon River to Bering Straits. W. B. Bradley, Geo. T. Foster, 15 Exchange Place, Jersey City, and W. H. Crawford, New York City, are incorporators.

BEERSVILLE R. R.—Application is being made at the current session of the New Brunswick Legislature for an act incorporating a company to build from Adamsville, on the Intercolonial, 30 miles northwest of Moncton, to a point on the Richibucto River, seven miles.

BELLINGHAM BAY & BRITISH COLUMBIA.—Press reports state that the new surveys of this company from Maple Falls, Wash., eastward through Okanoga County, in the direction of Spokane, have been made to a point 35 miles south of the Colville reservation. This company intends to build the line eventually to Spokane.

BILOXI, WAYNESBORO & COHABA VALLEY.—This company, which was recently incorporated in Mississippi, will build from Biloxi, Miss., to a point on the Tombigbee River in Alabama. W. O. Talbot and others of Biloxi, are incorporators. (See Construction Supplement.)

BLACK HILLS & NORTHWESTERN.—Articles of incorporation have been filed by this company in the State of Washington. The proposed route is from Olympia into the Quinault Indian reservation in Chehalis County, Wash., about 100 miles. Lester Turner, Seattle, Wash., and others, are interested.

BLACKWELL, FAIRMOUNT & SOUTHERN.—A charter has been granted this company in Oklahoma Territory to build from Blackwell, in Kay County, southwest through Garfield, Kingfisher and Canadian Counties to El Reno, about 100 miles. The incorporators are T. S. Chambers, D. S. Rose, F. M. Butcher, R. A. Dismer and others, of Blackwell.

BOWMAN CREEK.—This company has been incorporated in West Virginia, to build from Boomer, Fayette County, W. Va., to the junction of the Great Kanawha and Gauley Rivers. The incorporators are W. C. Merrick, W. B. Stuart, R. H. Crowell and others, of Cleveland, Ohio.

CHARLESTON & MISSOURI RIVER.—Preliminary surveys for the extension of this line from Grays Point, Mo., southeast to a point opposite Hickman, Ky., 56 miles, have been finished. Grading will be begun shortly. E. B. Priest, Charleston, Mo., is Chief Engineer.

CHICAGO, BURLINGTON & QUINCY.—It is stated that this company will build a line from Greenfield, Iowa, east to Winterset, and thence to Norwalk, 45 miles, where a connection will be made with the Keokuk & Western. A connection will be made with the Chicago, Rock Island & Pacific at Winterset.

A charter has been granted to this company in Missouri to build a branch line from Old Monroe west to Mexico, Mo., 62 miles. Connection will be made with the Chicago & Alton and the Wabash at Mexico.

COLORADO & SOUTHERN.—An extension will be built by this company from Orin Junction northwest to Douglas, Wyo., 15 miles. This line, when completed, will parallel the Fremont, Elkhorn & Missouri Valley between these points.

COLUMBUS & LAKE MICHIGAN.—Surveys are reported finished for an extension of this line from Lima southeast to Columbus, Ohio, 70 miles. Contract for grading has been let to the Empire Construction Co. C. T. Hobart, Lima, Ohio, is Chief Engineer.

COLUMBUS, MARYSVILLE & BELLEFONTAINE (ELECTRIC).—This company has been incorporated in Ohio, to build an electric line from Columbus northwest via Marysville to Bellefontaine, 60 miles, paralleling the Toledo & Ohio Central for the greater part of the distance. W. H. Luchtenberg, R. O. Luchtenberg, L. J. Guthke and O. E. Luchtenberg, all of Columbus, Ohio, are said to be interested.

GREAT NORTHERN.—It is said that this company has been notified by the authorities who are in charge of the National irrigation work, that about 27 miles of track west of Malta, Mont., must be removed to a point about 10 miles north of the present location, to make room for a large reservoir that is to be built on the outskirts of Malta.

ILLINOIS CENTRAL.—Work is now in progress on a cut-off from Cedar Falls, Iowa, west to a point near New Hartford, six miles. The new line will reduce the main line distance a quarter of a mile and will make the grade 26 ft. instead of 71 ft.

The approaches to the Cairo bridge over the Ohio River are to be filled during 1903, and a double track laid. The work will require about 1,000,000 cu. yds. of earth, and the estimated cost is $700,000. Contracts have not yet been let. The present structure consists of an iron trestle 3,255 ft. long at one end of the bridge, and one 2,655 ft. long at the other.

IOWA, ILLINOIS & MISSOURI.—This company has recently been incorporated in Illinois, with headquarters at Rock Island, Ill. The proposed route is from Dubuque, Iowa, south to St. Louis, passing through Davenport, Rock Island and Moline. G. T. Cram, St. Louis; S. S. Hall, Monmouth, Ill.; W. A. Rosenfield, Moline; A. F. Cutter, Davenport, Iowa, and others, are incorporators.

IOWA RY.—This company has been organized in Iowa, with a capital stock of $135,000, for the purpose of building a line from Pella to a connection with the Des Moines-St. Louis Division of the Wabash, near Howell, four miles. The headquarters of the company are at Oskaloosa, Iowa. T. J. Price, John J. Price, S. P. Hawkins and others are incorporators. The Pella & Southwestern was organized in 1901, to build this line, but has never done anything beyond making some surveys.

KANSAS CITY, MEXICO & ORIENT.—Surveys are reported practically finished for the location of the new branch line of this company from San Angelo, Texas, to Tampico, Mexico, via Laredo, Texas, a total distance of about 800 miles. It is said that work will be begun shortly.

KANSAS CITY, MEXICO & ORIENT.—The section of this road from Topolobampo to Fuerte, Mexico, 70 miles, has been opened for traffic.

LAKE ERIE, RAVENNA & SOUTHERN.—This company has been incorporated in Ohio. It is proposed to build from Mentor south to Alliance, Ohio, a distance of about 50 miles. F. H. Goff, J. E. Morley, W. T. Carr and others, of Cleveland, Ohio, are said to be interested.

LOS ANGELES, DAGGETT & TONAPAH.—An officer writes that the proposed route of this road is from Daggett, Cal., to Tonapah, Nev., 235 miles, running north and south through San Bernardino and Inyo Counties in California, and Esmeralda and Nye Counties in Nevada. Contracts for grading will be let in the near future. The character of the work is light, with a maximum grade of 1.8 per cent., and maximum curvature of 3 deg. J. Irving Crowell, Los Angeles, Cal., is President, and H. W. Griswold, 120 Sutter street, San Francisco, Chief Engineer. (April 3, p. 256.)

LOUISIANA & ARKANSAS.—Grading is reported practically finished on the extension of this line from Stamps to Hope, Ark., 23 miles. Track has been laid for 15 miles, and the remainder will probably be finished about June 1. Connection will be made with the Missouri Pacific and the St. Louis, Iron Mountain & Southern at Hope.

MADISON, GREENSBURG & INDIANAPOLIS (ELECTRIC).—This company, which has recently been incorporated in Indiana, will build an electric line from Madison north through Versailles and Osgood, and thence in a northwesterly direction through Shelby, Johnson and Marion Counties to Indianapolis, a total distance of about 100 miles. M. D. Wilson, L. V. Cravens and others, of Indianapolis, are interested.

MEXICAN CENTRAL.—The branch line of this road, which is being built from San Pedro, Mexico, north to San Antonio, Texas, is completed for about 52 miles, and is graded as far as Paredon, Mex., 200 miles.

MICHIGAN CENTRAL.—Two contracts have been let by this company. One is for a second track from Marshall west to Augusta, Mich., 23 miles. The line between these two points will be straightened. The other contract is for improving the line from Kalamazoo west to Oshtemo.

MILLEN & SOUTHWESTERN.—Press reports state that grading is now in progress on the extension from Stillmore south to Vidalia, Ga., 21 miles. Surveys are reported for an extension from Millen to a point on the Savannah River, about 35 miles distant. F. D. Durden, Monte, Ga., is General Manager.

MILWAUKEE & SOUTHERN.—This company, which has recently filed articles of incorporation in Wisconsin, proposes to build from Milwaukee, Wis., southwest to East St. Louis. R. B. Tabor, of Chicago; J. B. Wallace, H. A. Porter, of Mukwonago, Wis., and others, are interested. (April 17, p. 290.)

MINNEAPOLIS, ST. PAUL & SAULT STE. MARIE.—This company will build a branch line from Glenwood, Minn., north via Alexandria to the White Earth Indian reservation in Norman County, a distance of about 200 miles. Connection will probably be made with the Northern Pacific in the vicinity of Detroit. No definite plans have as yet been given out with regard to the exact location of the proposed route. (Official.)

MONEGAN SPRINGS.—Press reports state that this company has completed its surveys and that the road will shortly be built. The proposed route is from Osceola, St. Clair County, Mo., northwest through Bates County to Monegan Springs. It is said that grading will be begun at once.

NASHVILLE, CHATTANOOGA & ST. LOUIS.—The extension from Bon Air, Tenn., to Ravenscroft, 10 miles, has been finished. Work is now in progress on an extension from De Rossett to Eastland, seven miles.

NEWBURG & SOUTH SHORE.—This company, which does a general switching service in the cities of Cleveland and Newburg, Ohio, furnishing terminal facilities for various industries and railroads, has begun work on a new line connecting its present yards in Cleveland with those in Newburg. The line will be about 5½ miles long, and all grading and bridging will be for double tracks. It will cross the Erie, the Baltimore & Ohio, the Wheeling & Lake Erie and the Pennsylvania at grade at Newburg. The difference in elevation between Cleveland and Newburg is 200 ft., making a maximum grade of 1.15 per cent, at one point on the line for a distance of about 4,000 ft. The principal business of this road will consist in handling metal and coke from the different railroads to the plants of the American Steel & Wire Co.; a general switching business will also be done.

NEWTON & NORTHWESTERN.—The contract for grading the extension of this line from Boone southeast to Metz, Iowa, a point on the Chicago, Rock Island & Pacific, in Jasper County, five miles west of Newton, has been let to Foley Bros., St. Paul. The extension will be 48 miles long. Grading will be begun at once. Grading on the extension from Fraser to Boone, seven miles, which was commenced last year, and which has been retarded by wet weather, is again in progress. The work will probably be completed early in the summer.

NORTHERN PACIFIC.—Press reports state that a contract has been let for double tracking this road between Auburn and Black River Junction, Wash., 15 miles, and also for a cut-off along the east shore of Lake Washington. H. C. Henry is reported to have received the contract.

PENNSYLVANIA.—Contracts have been awarded for the new line between Glen Loch and Thorndale, Pa., as follows: Glen Loch section to Reiter, Curtis & Hill; Bradford Hills section to P. F. Brendlinger, Philadelphia; Thorndale section to P. McManus, Philadelphia; Valley Creek bridges and abutments to Sparks & Evans; Downington section to the Pinkerton Construction Co. (April 3, p. 256.)

PITTSBURGH, CHARTIERS & YOUGHIOGHENY.—Bids are reported as being asked for building the new yards of this company at Scullys, Pa., between Carnegie and Duff. At these yards will be done much work which has heretofore been done at the large yards of the Pittsburgh & Lake Erie and the Pittsburgh, Cincinnati, Chicago & St. Louis. The new yards are to be built for the purpose of relieving the congestion of these other yards.

PORTLAND, VANCOUVER & YAKIMA.—An officer writes that the contract for the four miles east of Vancouver, Wash., has been let to the Pacific Coast Construction Co., of Portland, Ore. The line is being built for the purpose of reducing the grade into Vancouver, and it will connect with the Washington & Oregon at Vancouver Lake. The work is heavy, with a maximum grade of 5 per cent., and maximum curvature of 6 deg. I. N. Gray, Vancouver, is President. (April 17, p. 290.)

SANDWICH, HYANNIS & CHATHAM (ELECTRIC).—Surveys have been finished for this electric road from Sandwich, Mass., via Hyannis to Chatham, 45 miles. The route selected is practically the same as that of a proposed steam road between these points, surveys for which were made several years ago. Contracts for this new road will probably be let some time in the near future.

SEABOARD AIR LINE.—Press reports say that this company has let a contract to the Alabama Construction Co. for grading 12 miles of track from Tampa, Fla., to the Coosa River.

SOUTH BEND & SOUTH MICHIGAN.—The extension of this line from South Bend to St. Joseph and Benton Harbor, Mich., will be made via Rolling Prairie, New Carlisle and Michigan City, instead of via Niles, Buchanan and Berrien Springs, as formerly planned. A. J. Hammond, South Bend, Chief Engineer. (See Construction Supplement.)

UNION TRACTION.—Authority has been granted this company by the State Railroad Commission, to build and operate an electric line from Batavia, N. Y., northwest to Lockport, 40 miles.

WESTERN MARYLAND.—Surveys are reported completed on five different routes for the connecting link of the Wabash System between the West Virginia Central and the Western Maryland railroads from Cumberland, Md., to Cherry Run. It is stated that the route selected crosses the Potomac into Maryland at Sinclairsville, W. Va., and runs by a direct line to South Cumberland. No official information has yet been given out, however. John Barlow, Cumberland, Md., is Chief Engineer. (Construction Supplement.)

YOUNGSTOWN & OHIO RIVER (ELECTRIC).—This company has been organized in Ohio, to build from Youngstown south through Lisbon and Salem, and eventually to East Liverpool. T. W. Hill, President of the Cleveland National Bank, has been elected President, and M. P. Goodman, Secretary. The needed rights of way between Lisbon and Salem have been mostly secured.

GENERAL RAILROAD NEWS.

BUFFALO, DUNKIRK & WESTERN.—The State Board of Railroad Commissioners has authorized this company to increase its capital stock from $305,000 to $3,500,000, and to issue first mortgage bonds to the amount of $3,500,000. The company proposes to build and operate an electric road 70 miles long from Westfield to Buffalo, N. Y.

CHICAGO & SOUTH SHORE.—This company has increased its capital stock from $300,000 to $1,000,000. The proceeds from about $700,000 of this will be used for building an extension. The road at present runs between Michigan City and Laporte, Ind.

KOKOMO, MARION & WESTERN TRACTION.—A notice has been filed by this company with the Secretary of State, stating that an increase of capital stock from $10,000 to $1,000,000 was decided upon at a recent meeting of the stockholders. The company has also filed notice of a change of name from the Kokomo, Converse & Marion Traction to the above title. G. J. Marrott, of Indianapolis, is President. It is the intention of the company to build a road from Kokomo, Ind., to Marion and Converse, about 60 miles.

LEHIGH VALLEY.—The merger of all the minor companies owned by this company in northern New Jersey and in New York has been decided upon. This merger was authorized at the recent session of the Legislature. The companies which are being merged are the Seneca County, the Rochester Southern, the Waverly & State Line, the Depew & Tonawanda, the Lehigh Ry., the Easton & Amboy, the Perth Amboy, the Greenville & Hudson, the Lehigh Valley Terminal, the Middletown and the Pittston Branch railroads.

NORTHERN SECURITIES.—W. H. Sanborn, of the United States Circuit Court, has granted the application made by the Northern Securities Co., to have the recent decree against the said company suspended so far as to permit the payment by the Great Northern and Northern Pacific Railroads of the regular May dividends to the Northern Securities Company. An appeal will be taken to the United States Supreme Court with regard to the recent decision as to the legality of the Securities Company.

OREGON SHORT LINE.—See San Pedro, Los Angeles & Salt Lake below.

RED RIVER & TEXAS SOUTHERN (ST. LOUIS & SAN FRANCISCO).—An amendment to the charter of this company has been filed in Texas, increasing its capital stock from $200,000 to $1,000,000. This road is a part of the St. Louis & San Francisco system, and is one of the lines embraced in the merger bill which was recently passed by the Texas Legislature and approved by the Governor. The increase in capital is said to be for an intended extension of the main line.

ST. LOUIS & SAN FRANCISCO.—The injunction which was brought by the Mayor of New Orleans against this company for the purpose of annulling the rights which were recently granted for building terminals in New Orleans and a belt line around the city, has been defeated. Press reports state that the company will shortly begin work on its new terminals, now that the opposition has been removed.

SAN PEDRO, LOS ANGELES & SALT LAKE.—This company has purchased the portion of the Oregon Short Line which lies south of Salt Lake City, extending through Utah to Calientes, Nev., including the Leamington cut-off. Senator W. A. Clark, who is President of the San Pedro, Los Angeles & Salt Lake, states that grading and track laying will be begun at Daggett, Cal., and the road will be extended from Calientes through Nevada to connect with a portion of his line already built from Los Angeles, and eventually form a through line from Salt Lake City to the Pacific.

TEXAS CENTRAL.—The annual report of this company for the year ending June 30, shows gross earnings of $593,667 as against $707,590 in 1901, a decrease of $113,923. Operating expenses were $434,924, a decrease of $6,880, leaving a decrease in net earnings of $107,044. The decrease in gross earnings was due in large part to a heavy drought that reduced the cotton crop. Freight revenue was $387,356 in 1902, and $514,572 in 1901. Passenger earnings increased $13,823. The construction work during the year consisted in building an extension from Waco to Ross, Texas, 11½ miles, now practically completed.